LAC MINERALS LTD.

Open File Report 91-5

EXTENSION OF THE MOUNT PLEASANT TIN DEPOSIT

CHARLOTTE COUNTY, NEW BRUNSWICK

(PART II)

by

LAC Minerals Limited

Canada-New Brunswick Mineral Development Agreement

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EXTENSION OF THE MOUNT PLEASANT TIN DEPOSIT

CHARLOTTE COUNTY, NEW BRUNSWICK

(PART II)

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Section 13000 through Saddle Area.

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Project Summary

Three deep diamond drill holes (LNZ 15, 16, and 17) were drilled in the Saddle area, the area in between the tin bearing North Zone and the workings of the Mount Pleasant Tungsten Mine in the Fire Tower Zone. (Fig. 1)

Total meterage drilled was 1713.2 m.

The main objective of the drilling was to investigate the apical areas and associated tin mineralization of Granite III, the youngest and deepest seated of three tin granites occurring in the North Zone.

The holes were drilled at 100 m centres. The western most hole (LNZ 17) is 100 m east of underground diamond drill hole C-4 which intersected 1.02% Sn over 7.0 m immediately below the Granite III contact. LNZ 17 is 200 m east of the North Zone access decline, linking the Fire Tower Zone with the North Zone.

All holes intersected the Granite III intrusion on the east flank and not in the apical part as expected. Only one hole, LNZ 16, yielded tin values in Granite III with 0.83% Sn + 0.03% WO_3 over 4.2 m.

However, all three holes intersected a hitherto unknown and separate Granite II intrusion which rises to within 260 m from surface. LNZ 15 intersected the Granite II body probably in the apical part. LNZ 16 an 17 intersected the intrusion in the steeply dipping east and west flank. (Fig. 2)

LNZ 15 yielded the widest tin intersection in Granite II (0.33% Sn over 39.6 m) and the highest grade intersection (0.73% Sn over 6.1 m).

Most of the tin deposits in the North Zone are associated with Granite II. The discovery of a separate Granite II intrustion with important endogranitic tin mineralization is very significant.

Sommaire du projet

Trois trous profonds de forage au diamant (LNZ 15, 16 et 17) ont été forés dans la région de Saddle, située entre la zone stannifère septentrionale et les exploitations de la mine de tungsten du Mount Pleasant, dans la zone de Fire Tower (figure 1).

La longueur totale forée fut de 1 713,2 m.

L'objectif principal du forage était d'examiner les régions apicales et la minéralisation stannifère associée au granite III, le plus jeune et le plus profond des trois granites stannifères se retrouvant dans la zone septentrionale.

Les trous furent forés selon une maille de 100 m. Le trou le plus à l'ouest, LNZ 17, est 100 m à l'est du trou souterrain C-4 qui a recoupé 1,02 % d'étain sur 7 m immédiatement au-dessous du contact du granite III. LNZ 17 est 200 m à l'est de la rampe d'accès de la zone septentrionale, reliant celle-ci à la zone de Fire Tower.

Tous les trous ont recoupé l'intrusion de granite III sur le flanc est et non pas dans la partie apicale tel que prévu. Seulement un trou, LNZ 16, a produit des valeurs d'étain dans le granite III soit 0,83 % Sn + 0,03 % WO3 sur 4,2 m.

Cependant, les trois trous ont recoupé une intrusion distincte de granite II, jusqu'ici inconnue, et qui s'élève à près de 260 m sous la surface. LNZ 15 a probablement recoupé l'intrusion dans sa partie apicale. LNZ 16 et 17 ont recoupé le granite II dans les flancs est et ouest qui sont très abruptes (figure 2).

LNZ 15 a produit l'intersection d'étain la plus large dans le granite II (0,33 % d'étain sur 39,6 m) et l'intersection de la plus haute teneur (0,73 % d'étain sur plus de 6,1 m).

La majorité des gisements stannifères de la zone septentrionale sont associés au granite II. La découverte d'une intrusion de granite II possédant une importante minéralisation stannifère endogranitique est donc particulièrement intéressante.

Acknowledgements

The project was undertaken by Lac Minerals Ltd. with a $50,000 contribution of the Mineral Investment Stimulation Program (MISP). The work was carried out on Billiton Metals Canada Inc.'s Mining Licence 1255.

1.0 Introduction

1.1 Objective

The objective of the project was to delineate apical areas of tin granites and explore for associated tin mineralization.

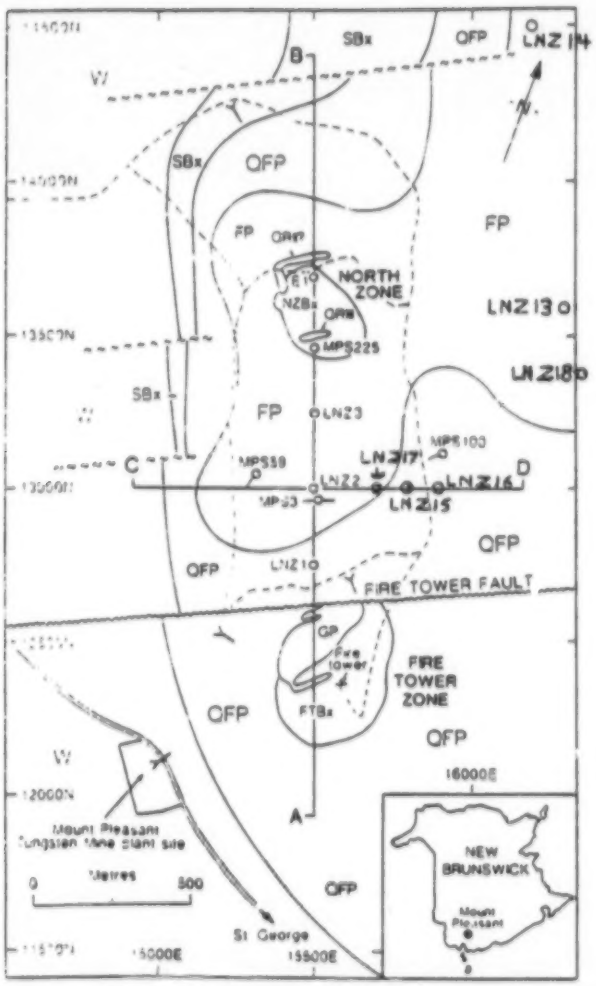
1.2 Scope

Deep vertical diamond drilling was considered the most effective method of exploring.

Three holes were collared east of known tin mineralization in the apical part of Granite III.

The holes were all drilled deeper (584, 593, 536 m) than proposed (400, 400, 500 m) to allow intersection of the Granite II/Granite III contact and exploring the apical parts of Granite III.

IP results became available after completion of LNZ 15 and 16 and was of some use to site LNZ 17. However, the area was considered an important exploration target due to the presence of a radiometric anomaly associated with a topographic high.



DEVONIAN AND/OR MISSISSIPPIAN

NORTH ZONE

- GRIII — Granite III
- GRII — Granite II
- GRI — Granite I
- NZBx — North Zone breccia

FIRE TOWER ZONE

- PG — Porphyritic granite
- QP — Granite porphyry
- FG — Fine grained granite
- FTBx — Fire Tower breccia

LATE DEVONIAN

PISKAHEGAN GROUP

- FP — Feldspar porphyry
- QFP — Quartz - feldspar porphyry
- SBx — Sedimentary breccia

SILURIAN

- W — Waweig Formation slate and greywacke

Geological boundary (defined, approximate, gradational)

Fault (defined, approximate)

Diamond - drill hole (vertical, inclined, on section, extrapolated to section)

Adit or decline

Mineralized zone

All weather road

Bush road

Figure 1. Surface geological map of the Mount Pleasant area (modified from Ruitenberg, 1967 and McCutcheon, 1983). Showing location of LNZ holes.

1.3 Background:

A recent paper by Sinclair et al (1988) is attached as Appendix 1. The paper is a summary of the Geology of the North Zone based on work carried out during 1985-1987 on the Lac-Billiton tin project.

2.0 Project Methodology

All cores were systematically logged for rock types, alteration styles, mineralization and RQD (Rock Quality Designation).

Selected cores were split and assayed in standard 10 foot lengths. Analytical results were routinely obtained for WO_3, MoS_2, As, Cu, Bi, Pb, Zn, Sn and Fe. Assaying was carried out at site by well established XRF methods.

Assistance for calibration was obtained from Lakefield Research of Lakefield, Ontario.

Most core of LNZ 15 was split and analyzed (140 samples), LNZ 16 and 17 were sampled to a lesser extent with 37 and 32 samples each.

3.0 Results and Discussion

3.1 Presentation of Results

Diamond drill hole summaries for LNZ 15, 16 and 17 are presented as Tables I-III.

Individual analytical results are tabulated in Tables IV, V and VI.

PC Explorer printout of Section 13,000 N showing individual holes is attached as Appendix 2.

3.2 Discussion

All three holes intersected tin-bearing zones. The best intersections were obtained in LNZ 15, with 0.33% Sn over 39.6 m and 0.73% Sn over 6.1 m. Poth intersections are hosted by Granite II. In LNZ 16 an intersection was obtained in Granite III grading 0.83% Sn + 0.30% Wo_3 over 4.2 m. Tin values within Granite II are lower in LNZ 16 and 17 than in LNZ 15.

4.0 Conclusion and Recommendations

All three holes intersected two tin granites, Granite II and Granite III. Most of tin deposits in the North Zone are associated with Granite II. Therefore, the discovery of a separate, well mineralized Granite II body is significant. It demonstrates that other Granite II cusps are present on the Mining Licence and that significant tin mineralization is not restricted to the North Zone.

It is recommended that the Saddle Area be given a high priority for future work. It is apparent from the radiometrics and the topography that the Granite II cusp discovered in LNZ 15, 16 and 17 will continue further north and south of Section 13,000 N.

5.0 References

Sinclair, W.D., Kooiman, G.J.A. and Martin, D.A., 1988, Geological setting of granites and related tin deposits in the North Zone, Mount Pleasant, New Brunswick; in Current Research, Part B, Geological Survey of Canada, Paper 88-1B, p. 201-208.

Table I

DIAMOND DRILL HOLE SUMMARY

HOLE NO: LNZ-15 COORDINATES: 13,000 N, 15,800 E COLLAR ELEVATION: 1,300 m

DATE STARTED: 02/08/88 HOLE SIZE: NQ 5.18-204.82 m CASING: 5.18 m

DATE COMPLETED: 05/10/88 BQ 204.82-584.27 m

Description	Log	Depth (m)	Intersection
Quartz-Feldspar Porphyry: Mixed stockwork, siliceous, chloritic quartz-feldspar porphyry.			
Sediments: Brecciated meta-sediments.			1, 2
Quartz-Feldspar Porphyry: Mixed stockwork, siliceous, chloritic and brecciated quartz-feldspar porphyry. Pyrite, arsenopyrite, sphalerite, galena, molybdenite, bismuth and trace wolframite, cassiterite in veining, replacements, breccia matrix, in altered quartz-feldspar porphyry and in breccia and pebble dykes. Two granite porphyry dykes occur between 241.5 - 241.6 m.		100 200	3, 4, 5, 6
Granite II: Mixed siliceous, chloritic, brecciated and stockwork equigranular to porphyritic granite. Tin mineralization varies from sparse to richer in zones within siliceous, chloritic and brecciated granite. Cassiterite, arsenopyrite and minor amounts of molybdenite, wolframite, sphalerite, chalcocite, chalcopyrite, pyrite and bismuth occur in veining, replacements, breccia matrix and in altered (best in siliceous) granite. Mineralization also in local siliceous pebble dykes intruding altered granite. Granite porphyry and granite dykes occur below 430 m.		300 400 500	7, 8, 9, 10, 11
Granite III: "Fresh" to siliceous, chloritic and stockwork granite.		EOH 584.27	

Lithological Summary: Hole LNZ-15 was drilled at a dip of approximately -90°. Altered quartz-feldspar porphyry was intersected to 260.9 m, being interrupted by a zone of brecciated sediments at 44.3-61.0 m. Biotite alteration locally accompanies silicification and chloritization. The quartz-feldspar porphyry is intruded by breccia dykes (70.2-70.6 m, 114.2-114.6 m, 114.8-115.0 m, 147.7-148.6 m) at 0°-13° to core axis, by pebble dykes (220.4-220.9 m, 239.6-239.8 m) and by irregular granite porphyry dykes (241.5-241.6 m). Sulfides, bismuth and trace amounts of wolframite, cassiterite occur in veining (sparse to stockwork pattern), replacements and breccia matrix with fluorite, chlorite and silica as well as in adjacent altered quartz-feldspar porphyry as disseminations, veinlets and replacing phenocrysts. Similar mineralization occurs within pebble and breccia dykes. Sulfides occur within the brecciated sediments in siliceous and chloritic matrix, in siliceous fragments and in cross-cutting veinlets veins rich in silica, chlorite and fluorite. Minor tin mineralization locally in brecciated sediments. Altered fine-grained equigranular to porphyritic granite II was intersected between 260.9 and 565.5 m. Endogranitic tin zones occur within siliceous, chloritic and brecciated granite at 304.8-344.4 m, 356.6-362.7 m, 368.8-371.8 m, 376.4-381.0 m and 399.3-405.4 m. Cassiterite, sulfides, wolframite and

bismuth occur in veining, replacements and breccia matrix with chlorite, silica and fluorite and in the adjacent altered granite as disseminations and clusters. Siliceous pebble dykes (between 311.7-337.4 m) host cassiterite and sulfides. The granite is intruded by granite porphyry dykes between 430.1 and 432.2 m in a stockwork pattern and granite dykes between 477.7 and 485.2 m at 0°-8° to core axis. "Fresh" to altered fine to medium-grained equigranular granite III was intersected below 565.5 m (contact at 22° to core axis). Fluorite, chlorite and silica-rich veining within siliceous and chloritic granite host minor amounts of bismuth, cassiterite and sulfides. The granite is intruded by a porphyritic granite dyke at 571.2-571.6 m, being 70° to core axis. The hole was stopped at 584.27 m in stockwork granite.

Mineralization:

Item	Grade	Width	Interval	Notes
1.	0.12% Sn 2.57% Zn	3.0 m	54.9- 57.9 m	Minor tin mineralization in brecciated sediments with sphalerite, pyrite, minor chalcopyrite. Mineralization occurs in veining and in siliceous matrix and fragments.
2.	0.08% Sn 1.61% Zn 1.59% Pb	3.1 m	73.1-76.2 m	Minor tin mineralization in brecciated quartz-feldspar porphyry with sphalerite, galena and minor arsenopyrite, chalcopyrite. Mineralization occurs in veining, breccia matrix and in adjacent siliceous quartz-feldspar porphyry as disseminations and replacing phenocrysts.
3.	0.48% Wo_3 0.33% MoS_2	3.0 m	182.9-185.9 m	Wolframite, molybdenite, minor galena and arsenopyrite in veining and as disseminations, replacing phenocrysts in adjecent siliceous quartz-feldspar porphyry.
4.	0.22% MoS_2 0.22% Bi	21.4 m	225.5-246.9 m	Molybdenite, arsenopyrite, pyrite, minor sphalerite and wolframite in veining, breccia matrix and in adjacent siliceous quartz-feldspar porphyry as disseminations and replacing phenocrysts.
5.	1.77% Zn	3.1 m	256.0-259.1 m	Sphalerite, arsenopyrite and trace cassiterite in siliceous quartz-feldspar porphyry as disseminations and replacing phenocrysts.
6.	2.51% Zn	3.1 m	268.2-271.3 m	Disseminations and clusters of sphalerite and arsenopyrite in siliceous granite.

Item	Grade	Width	Interval	Notes
7.	0.33% Sn 0.13% Bi 0.09% WO_3 0.09% MoS_2	39.6 m	304.8-344.4 m	Arsenopyrite, cassiterite (fine to coarse-grained), molybdenite and chalcocite in veining, replacements, breccia matrix and as disseminations, clusters in siliceous granite. Wolframite and bismuth locally in veining and breccia matrix. Few mineralized siliceous pebble dykes.
8.	0.41% Sn 0.19% Bi 0.19% WO_3	6.1 m	356.6-362.7 m	Arsenopyrite and cassiterite (fine to coarse-grained) in veining, replacements and as disseminations, clusters in siliceous, chloritic granite. Wolframite in veining and replacements.
9.	0.26% Sn	3.0 m	368.8-371.8 m	Cassiterite (medium to coarse-grained), minor arsenopyrite, wolframite and molybdenite in veining.
10.	0.47% Sn 0.12% WO_3	4.6 m	376.4-381.0 m	Cassiterite (fine to coarse-grained), sphalerite and arsenopyrite in veining, replacement zone and in adjacent siliceous, chloritic granite as disseminations and clusters.
11.	0.73% Sn 0.27% WO_3	6.1 m	399.3-405.4 m	Cassiterite (fine to coarse-grained), wolframite and minor amounts of arsenopyrite, molybdenite, chalcopyrite and bismuth in replacements. Cassiterite also in micro-veins in adjacent siliceous, chloritic granite.

Table II

DIAMOND DRILL HOLE SUMMARY

HOLE NO: LNZ-16 COORDINATES: 13,000 N, 15,900 E COLLAR ELEVATION: 1,300 m

DATE STARTED: 18/08/88 HOLE SIZE: NQ 2.13-593.42 m CASING: 2.13 m

DATE COMPLETED: 04/09/88

Description	Log	Depth (m)	Intersection
Quartz-Feldspar Porphyry: Mixed siliceous, chloritic, stockwork and brecciated quartz-feldspar porphyry. Pyrite, sphalerite, galena, arsenopyrite, chalcopyrite, molybdenite, wolframite and trace bismuth in veining, replacements, in some breccia matrix and in altered quartz-feldspar porphyry. Cassiterite locally in vein, replacement and breccia matrix material. Breccia dykes occur above 35 m, bearing sphalerite, galena, pyrite and chalcopyrite. Granite dykes intrude the quartz-feldspar porphyry below 349 m. A horizon of brecciated brown and chloritic sediments occurs at 37.6-41.5 m with arsenopyrite, pyrite, chalcopyrite and wolframite in brecciated sediment matrix and in cross-cutting veining.		100 200 300 400	1
Granite II: Mixed siliceous, chloritic, stockwork and brecciated granite. Tin mineralization with sulfides, local wolframite, and local magnetite in veining, replacements, breccia matrix and in adjacent siliceous, chloritic granite.		500	2 3 4
Granite III: "Fresh" to stockwork, siliceous and chloritic granite.		EOH 593.42	5

Lithological Summary: Hole LNZ-16 was drilled approximately 100 m east of LNZ-15, at a dip of approximately -90°. Altered quartz-feldspar porphyry was intersected to 440.3 m, being interrupted at 37.6-41.5 m by a horizon of brecciated sediments. Minor biotite alteration locally with silicification and chloritization. The quartz-feldspar porphyry is intruded by breccia dykes (16.6-16.7 m, 26.5-27.1 m, 30.6-31.6 m and 34.0-34.3 m) at 18°-28° to core axis and granite dykes (349.1-351.3 m, 366.1-366.5 m, 393.0-393.1 m, 433.3-434.2 m and 436.9-437.1 m) at 8°-50° to core axis. Replacements, sparse to stockwork veining and local breccia matrix are rich in chlorite, fluorite and silica with mineralization consisting of sulfides, wolframite, local cassiterite and trace bismuth. Mineralization also occurs in adjacent altered (mainly siliceous) quartz-feldspar porphyry as disseminations and replacing phenocrysts. Sulfides also occur in breccia dykes and with minor wolframite in chloritic, siliceous matrix of brecciated sediments. Altered granite II was intersected between 440.3 and 552.5 m. Granite texture varies from fine-grained equigranular to porphyritic to coarse-grained pegmatitic. Endogranitic tin mineralization occurs within

siliceous, chloritic and brecciated granite, being generally trace to minor. Two richer zones occur at 533.4-534.0 m and 545.6-548.9 m. Cassiterite, pyrite, local wolframite and trace to minor amounts of arsenopyrite, sphalerite, molybdenite and chalcopyrite occur in stockwork veining, replacements and breccia matrix with silica, fluorite and chlorite. Mineralization also as disseminations and clusters in adjacent siliceous, chloritic granite. Magnetite occurs locally in dense chlorite replacements and adjacent chloritic granite. A porphyritic granite dyke intrudes the granite at 468.0-468.2 m, being 4° to core axis. Altered to greyish and pale orange "fresh" Granite III was intersected (contact is 70° to core axis) at 552.5 m. Granite texture is fine-grained porphyritic. Sparse to stockwork veining consisting of chlorite, fluorite, silica and carbonates. Best veining plus replacements occur in local siliceous, chloritic granite. An endogranitic tin zone occurs at 566.9-571.1 m. Here cassiterite occurs with pyrite, arsenopyrite and wolframite in veining, replacements and as disseminations, clusters in chloritic, siliceous granite. The hole was stopped at 593.42 m in stockwork granite.

Mineralization:

Item	Grade	Width	Interval	Notes
1.	0.25% Sn 2.05% Zn	3.1 m	185.9-189.0 m	Medium to coarse-grained cassiterite with pyrite, sphalerite, chalcopyrite, trace galena and arsenopyrite in veining and replacements. Sulfides in adjacent siliceous, chloritic quartz-feldspar porphyry as disseminations, clusters and replacing phenocrysts.
2.	0.21% Sn	3.0 m	432.8-435.8 m	Medium to coarse-grained cassiterite with pyrite in veining and breccia matrix adjacent to granite dyke. Cassiterite also as disseminations and clusters in chloritic quartz-feldspar porphyry and granite dyke.
3.	0.85% Sn 0.23% Wo_3	0.6 m	533.4-534.0 m	Fine to coarse-grained cassiterite with pyrite, magnetite and wolframite in veins, replacements and in adjacent chloritic granite as disseminations and clusters.
4.	0.66% Sn 0.21% Wo_3	3.3 m	545.6-548.9 m	Fine to coarse-grained cassiterite with pyrite, magnetite, wolframite in veining, replacements and breccia matrix and as disseminations and clusters in adjacent siliceous, chloritic granite.
5.	0.83% Sn 0.30% Wo_3	4.2 m	566.9-571.1 m	Fine to coarse-grained cassiterite with pyrite in veining and replacements and as disseminations and clusters in adjacent siliceous, chloritic granite. Magnetite and wolframite also in veining and replacements.

Table III

DIAMOND DRILL HOLE SUMMARY

HOLE NO: LNZ-17 COORDINATES: 13,000 N 15,700 E COLLAR ELEVATION: 1,280 m

DATE STARTED: 06/09/88 HOLE SIZE: NQ 4.27-404.45 m CASING: 4.27 m

DATE COMPLETED: 21/09/88 BQ 404.45-535.51 m

Description	Log	Depth (m)	Intersection
Quartz-Feldspar Porphyry: Mixed siliceous, chloritic and stockwork quartz-feldspar porphyry.			
Sediments: Brecciated meta-sediments.			1
Quartz-Feldspar Porphyry: Mixed siliceous, chloritic, stockwork and brecciated quartz-feldspar porphyry. Pyrite, arsenopyrite, sphalerite, galena, chalcopyrite, molybdenite, wolframite and local bismuth, chalcocite and cassiterite in veining, replacements, breccia matrix and in altered quartz-feldspar porphyry. Breccia and pebble dykes intrude the quartz-feldspar porphyry, many of which host sulfides. Granite dykes intrude the quartz-feldspar porphyry below 269 m.		100 200 300	2 3
Granite II: Mixed siliceous, chloritic and stockwork granite. Sulfides, wolframite, bismuth, magnetite and cassiterite in veining and replacements. Sulfides common in adjacent altered granite.		400	4 5
Granite II: "Fresh" to siliceous and chloritic granite.		500 EOH 535.51	

Lithological Summary: Hole LNZ-17 was drilled approximately 100 m west of LNZ-15, at a dip of approximately -90°. Altered quartz-feldspar porphyry was intersected to 395.6 m, being interrupted between 42.7 and 66.8 m by a zone of brecciated sediments. Biotite alteration locally accompanies silicification and chloritization. Locally within highly siliceous quartz-feldspar porphyry are kaolinized patches and bands. Numerous breccia and pebble dykes intrude the quartz-feldspar porphyry between 16.2 and 315.6 m at 6°-66° to core axis. Granite dykes intrude the quartz-feldspar porphyry between 269.2 and 391.4 m at various angles to core axis. Sulfides, wolframite, local bismuth and cassiterite occur in veining (sparse to stockwork pattern), replacements and breccia matrix with fluorite, chlorite and silica as well as in altered (mainly siliceous) quartz-feldspar porphyry as veinlets, disseminations and replacing phenocrysts. Mineralization is locally richer in milky kaolinized patches and bands. Similar mineralization occurs within the brecciated sediments in veining and breccia matrix. Chloritic, siliceous and brown sediment fragments occur in a chlorite, silica and fluorite-rich matrix. Quartz-feldspar porphyry fragments occur within the outer portions of this brecciated sediment horizon. Altered fine-grained equigranular to pegmatitic granite II was intersected between 395.6 and 494.7 m.

Low grade tin mineralization occurs locally within veining (sparse to stockwork pattern) and replacements rich in silica, fluorite and chlorite. Also in veining, replacements are pyrite, arsenopyrite, chalcopyrite, chalcocite, sphalerite, magnetite, molybdenite, wolframite and bismuth. Mineralized veining and replacements are predominantly local to siliceous and chloritic granite. Sulfides and local wolframite also occur as disseminations and clusters within siliceous granite. The granite is intruded by an aplite dyke at 454.2-454.3 m, being 9° to core axis. Altered to light green and greyish "fresh" granite XII was intersected between 494.7 m and end of hole. Granite texture varies from fine to medium-grained equigranular to porphyritic. Pyrite, arsenopyrite, wolframite and bismuth occur in sparse to stockwork veining rich in fluorite, silica, chlorite and carbonates. This veining is best developed in siliceous and chloritic granite. Siliceous granite locally host disseminated arsenopyrite, sphalerite and small replacements with fluorite and bismuth.

Mineralization:

Item	Grade	Width	Interval	Notes
1.	0.41% Sn 3.71% Zn 1.27% Pb 0.52% Cu 0.12% WO_3	3.0 m	61.0-64.0 m	Tin mineralization with pyrite, chalcopyrite, arsenopyrite, sphalerite and galena in stockwork veining, in matrix of brecciated sediments and in few chloritic quartz-feldspar porphyry fragments. Wolframite in breccia matrix.
2.	0.33% Sn 0.12% WO_3	6.1 m	350.5-356.6 m	Fine to coarse-grained cassiterite with wolframite and trace molybdenite in stockwork to sub-parallel veining. Cassiterite also as disseminations and clusters in chloritic quartz-feldspar porphyry and chloritic granite dykes (?).
3.	0.80% Sn 2.09% Zn 0.58% Cu 0.40% WO_3	3.0 m	374.9-377.9 m	Medium to coarse-grained cassiterite with sphalerite, chalcopyrite, wolframite, arsenopyrite and minor molybdenite in veining and replacements.
4.	0.14% Sn 0.16% Bi 0.13% WO_3	3.1 m	420.6-423.7 m	Medium to coarse-grained cassiterite with wolframite, bismuth and trace molybdenite in veining and replacements.
5.	0.12% Sn 0.15% Bi 0.21% MoS_2 1.40% WO_3	3.0 m	426.7-429.7 m	Medium-coarse-grained cassiterite with wolframite, bismuth, molybdenite and arsenopyrite in veining and replacements. Disseminated wolframite in siliceous granite.

PC-XPLOR VERSION 1.20 GEOPLOT INC.
Exploration Data Manager Serial no: 20000
By GEMCOM SERVICES INC. 23/12/88 Page : 9
*** LAC MINERALS LTD. ***
*** LAC BILLITON TIN PROJECT ***

HOLE-ID: LNZ-15

EASTING: 15800.0 NORTHING:13000.0 ELEVATION: 1300.0
LENGTH: 587.3
LITHOLOGY DATA

FROM	TO	ROCK TYPE	REMARKS
.0	3.4		
3.4	8.6	SIL/CHL	QFP
8.6	12.2	STW	QFP
12.2	41.1	MIX	QFP
41.1	45.7	BX	QFP
45.7	61.0	BX	SED
61.0	70.1	MIX	QFP
70.1	70.6	SIL/CHL	BX-DYKE
70.6	73.5	MIX	QFP
73.5	74.1	REPL-ZONE	REPL-ZONE
74.1	91.4	SIL/CHL	QFP
91.4	114.2	MIX	QFP
114.2	114.6	BX-DYKE	BX-DYKE
114.6	136.9	MIX	QFP
136.9	143.4	STW	QFP
143.4	144.8	MIX	QFP
144.8	145.0	BX-DYKE	BX-DYKE
145.0	147.7	SIL/CHL	QFP
147.7	148.6	BX-DYKE	BX-DYKE
148.6	150.9	SIL/CHL	QFP
150.9	160.5	STW	QFP
160.5	176.8	SIL/CHL	QFP
176.8	179.8	CHL/STW	QFP
179.8	185.9	STL/CHL	QFP
185.9	192.0	MIX	QFP
192.0	201.2	SIL/CHL	QFP
201.2	207.3	MIX	QFP
207.3	220.4	SIL/CHL	QFP
220.4	220.9	SIL	PEB-DYKE
220.9	226.9	SIL/BX	QFP
226.9	237.7	SIL	QFP
237.7	239.6	SIL/BX	QFP
239.6	239.8	SIL	PEB-DYKE
239.8	241.5	SIL/BX	QFP
241.5	241.6	GP-DYKES	GP-DYKES
241.6	245.1	BX	QFP
245.1	262.1	SIL/CHL	QFP
262.1	257.0	MIX	QFP
257.0	257.6	REPL-ZONE	REPL-ZONE
257.6	260.9	SIL/CHL	QFP
260.9	265.2	SIL	GRII
265.2	268.7	SIL/CHL	GRII
268.7	269.1	REPL-ZONE	REPL-ZONE
269.1	272.6	SIL/CHL	GRII
272.6	282.5	CHL/STW	GRII
282.5	295.7	MIX	GRII

295.7	311.7	SIL	GRII
311.7	311.8	SIL	PEB-DYKE
311.8	317.0	SIL	GRII
317.0	317.9	SIL/BX	GRII
317.9	320.0	REPL-ZONES	REPL-ZONES
320.0	322.1	SIL/BX	GRII
322.1	322.8	SIL	PEB-DYKES
322.8	332.2	SIL	GRII
332.2	335.9	SIL/CHL	GRII
335.9	337.4	SIL	PEB-DYKES
337.4	344.4	SIL/CHL	GRII
344.4	345.2	REPL-ZONE	REPL-ZONE
345.2	357.4	MIX	GRII
357.4	358.1	REPL-ZONE	REPL-ZONE
358.1	363.4	SIL/CHL	GRII
363.4	363.8	REPL-ZONE	REPL-ZONE
363.8	365.4	SIL/CHL	GRII
365.4	371.9	MIX	GRII
371.9	376.5	SIL/CHL	GRII
376.5	377.2	REPL-ZONE	REPL-ZONE
377.2	378.4	SIL/CHL	GRII
378.4	379.2	CHL	BX-DYKE
379.2	399.5	MIX	GRII
399.5	404.3	REPL-ZONES	REPL-ZONES
404.3	417.6	MIX	GRII
417.6	430.1	STW	GRII
430.1	432.3	GP-DYKES	GP-DYKES
432.3	435.9	MIX	GRII
435.9	442.0	STW	GRII
442.0	445.0	MIX	GRII
445.0	451.1	STW	GRII
451.1	454.2	MIX	GRII
454.2	472.4	STW	GRII
472.4	475.5	STW/CHL	GRII
475.5	477.7	STW	GRII
477.7	480.8	GR-DYKES	GR-DYKES
480.8	484.7	MIX	GRII
484.7	485.2	GR-DYKE	GR-DYKE
485.2	499.7	CHL/STW	GRII
499.7	500.0	FL/CHL-VEIN	FL/CHL-VEIN
500.0	509.0	MIX	GRII
509.0	524.3	STW	GRII
524.3	536.4	CHL/STW	GRII
536.4	542.5	STW	GRII
542.5	548.6	MIX	GRII
548.6	551.7	STW	GRII
551.7	554.7	MIX	GRII
554.7	558.0	STW	GRII
558.0	558.1	GR-DYKE	GR-DYKE
558.1	565.6	MIX	GRII
565.6	568.8	GRIII	GRIII
568.8	569.0	SIL/CHL	GRIII
569.0	571.3	STW	GRIII
571.3	571.6	P/GR-DYKE	P/GR-DYKE

*** LAC MINERALS LTD. ***
*** LAC BILLITON TIN PROJECT ***

571.6	576.1	STW	GRIII	
576.1	582.2	GRIII	GRIII	
582.2	584.3	STW	GRIII	
.0	.0	0.00	0.00	

SAMPLE DATA

FROM	TO	WO3	MOS2	AS	BI	CU	PB	ZN	Sn	FE	SAMPLE#
3.4	6.1	.00	.00	.2	.00	.02	.04	.06	.00	2.35	13532.00
6.1	9.1	.00	.04	.1	.01	.02	.05	.03	.00	4.59	13533.00
9.1	12.2	.00	.00	.1	.01	.06	.00	.01	.00	2.20	13534.00
12.2	15.2	.00	.00	.1	.01	.04	.00	.02	.00	2.65	13535.00
15.2	18.3	.00	.02	.2	.01	.04	.04	.09	.00	4.74	13536.00
18.3	21.3	.00	.04	.2	.01	.03	.01	.04	.00	2.96	13537.00
21.3	24.4	.00	.01	.1	.00	.02	.06	~~.00~~.17	.00	5.09	13538.00
24.4	27.4	.00	.03	.1	.01	.04	.05	.28	.00	3.66	13539.00
27.4	30.5	.00	.03	.4	.02	.02	.27	.32	.01	4.72	13540.00
30.5	33.5	.00	.02	.2	.02	.02	.02	.07	.00	3.93	13541.00
33.5	36.6	.00	.01	.1	.01	.05	.01	.04	.00	3.04	13542.00
36.6	39.6	.00	.02	.1	.01	.02	.01	.05	.00	4.26	13543.00
39.6	42.7	.00	.01	.1	.02	.03	.00	.05	.00	5.05	13544.00
42.7	45.7	.00	.01	.1	.01	.05	.00	.07	.00	7.19	13545.00
45.7	48.8	.00	.01	.2	.01	.03	.00	.10	.00	9.69	13546.00
48.8	51.8	.00	.01	.1	.01	.03	.00	.08	.00	7.25	13547.00
51.8	54.9	.00	.00	.1	.01	.02	.00	.08	.00	8.85	13548.00
54.9	57.9	.00	.01	.3	.01	.18	.07	2.57	.12	5.64	13549.00
57.9	61.0	.00	.00	.1	.01	.04	.01	.89	.00	7.23~~7.56~~	13550.00
61.0	64.0	.00	~~.00~~.02	.1	~~.01~~.06	~~.04~~.01	.01	~~.89~~.03	.00	~~7.23~~	13551.00
64.0	67.1	.00	.02	.1	.02	.04	.00	.02	.00	3.57	13552.00
67.1	70.1	.00	.02	.6	.07	.03	.00	.04	.00	4.11	13553.00
70.1	73.2	.00	.04	.1	.02	.05	.01	.04	.00	5.81	13554.00
73.2	76.2	.00	.04	.5	.02	.10	1.59	1.61	.08	3.70	13555.00
76.2	79.2	.00	.01	.2	.01	.04	.19	.57	.00	5.95	13556.00
79.2	82.3	.00	.05	.3	.02	.05	.25	.87	.02	6.56	13557.00
82.3	85.3	.00	.04	.1	.01	.02	.05	.15	.00	7.86	13558.00
85.3	88.4	.00	.03	.1	.01	.03	.47	.40	.00	5.98	13559.00
88.4	91.4	.00	.02	.2	.02	.02	.06	.17	.00	5.15	13560.00
91.4	94.5	.00	.03	.1	.01	.01	.02	.04	.00	3.82	13561.00
94.5	97.5	.00	.01	.1	.02	.01	.02	.06	.00	3.92	13562.00
97.5	100.6	.00	.03	.2	.03	.03	.08	.28	.00	3.91	13563.00
100.6	103.6	.00	.01	.1	.02	.04	.12	.92	.00	5.76	13564.00
103.6	106.7	.00	.01	.2	.02	.01	.13	.32	.00	4.19	13565.00
106.7	109.7	.00	.04	.0	.01	.02	.00	.00	.00	3.73	13566.00
109.7	112.8	.00	.01	.2	.02	.01	.01	.06	.00	5.32	13567.00
112.8	115.8	.00	.04	.0	.01	.02	.05	.06	.00	4.98	13568.00
115.8	118.9	.00	.04	.0	.03	.01	.00	.00	.00	3.66	13569.00
118.9	121.9	.00	.04	.0	.01	.01	.00	.00	.00	4.68	13570.00
121.9	125.0	.00	.01	.0	.01	.00	.00	.00	.00	3.03	13571.00
125.0	128.0	.00	.05	.2	.02	.01	.01	.00	.00	3.97	13572.00
128.0	131.1	.00	.03	.1	.02	.02	.01	.07	.00	2.24	13573.00
131.1	134.1	.00	.02	.1	.04	.01	.00	.00	.00	3.26	13574.00
134.1	137.2	.00	.02	.4	.05	.01	.01	.07	.00	3.80	13575.00
137.2	140.2	.00	.02	.1	.01	.01	.00	.00	.00	2.26	13576.00
140.2	143.3	.00	.01	.1	.01	.01	.00	.00	.00	2.85	13577.00
143.3	146.3	.00	.03	.2	.04	.02	.06	.33	.02	4.65	13578.00

146.3	149.4	.00	.09	.4	.06	.01	.01	.01	.00	4.31	13579.00
149.4	152.4	.01	.03	.4	.04	.02	.00	.28	.00	4.26	13580.00
152.4	155.4	.00	.01	.1	.02	.01	.00	.00	.00	2.46	13581.00
155.4	158.5	.00	.03	.1	.01	.01	.00	.00	.00	3.20	13582.00
158.5	161.5	.00	.02	.1	.02	.01	.01	.03	.00	3.46	13583.00
161.5	164.6	.00	.03	.2	.02	.02	.02	.06	.00	4.90	13584.00
164.6	167.6	.00	.03	.1	.08	.02	.01	.07	.00	4.78	13585.00
167.6	170.7	.00	.00	.1	.03	.01	.02	.09	.00	6.34	13586.00
170.7	173.7	.04	.03	.2	.05	.07	.12	.75	.09	3.78	13587.00
173.7	176.8	.00	.04	.1	.06	.02	.10	.35	.00	5.06	13588.00
176.8	179.8	.00	.02	.1	.02	.02	.01	.12	.00	3.65	13589.00
179.8	182.9	.02	.08	.2	.03	.02	.08	.49	.00	4.76	13590.00
182.9	185.9	.48	.33	.1	.09	.02	.19	.02	.00	5.70	13591.00
185.9	189.0	.01	.03	.0	.03	.05	.11	.75	.04	3.63	13592.00
189.0	192.0	.00	.11	.1	.04	.03	.02	.19	.00	4.46	13593.00
192.0	195.1	.06	.11	~~3.4~~	.07	.03	.04	.25	.00	4.22	13594.00
195.1	198.1	.03	.13	.1	.08	.02	.01	.10	.00	6.24	13595.00
198.1	201.2	.00	.05	.1	.04	.02	.00	.07	.00	7.50	13596.00
201.2	204.2	.00	.16	.0	.04	.01	.03	.00	.00	3.89	13597.00
204.2	207.3	.00	.08	.0	.06	.01	.19	1.09	.02	6.12	13598.00
207.3	210.3	.00	.11	.0	.04	.04	.02	.76	.00	3.78	13599.00
210.3	213.4	.00	.04	.0	.02	.03	.01	.24	.00	2.50	13600.00
213.4	216.4	.00	.04	.0	.03	.03	.00	.34	.00	7.58	13601.00
216.4	219.5	.00	.11	.0	.07	.03	.01	.96	.02	3.95	13602.00
219.5	222.5	.00	.10	.2	.08	.01	.00	.04	.00	2.49	13603.00
222.5	225.6	.00	.13	.5	.12	.01	.00	.00	.00	1.20	13604.00
225.6	228.6	.00	.23	.8	.22	.02	.00	.00	.00	1.57	13605.00
228.6	231.6	.04	.10	1.3	.14	.01	.00	.00	.00	1.62	13606.00
231.6	234.7	.05	.12	.7	.19	.02	.00	.13	.00	1.63	13607.00
234.7	237.7	.00	.24	.0	.25	.03	.00	.14	.00	1.71	13608.00
237.7	240.8	.00	.30	.1	.31	.02	.00	.00	.00	1.33	13609.00
240.8	243.8	.00	.19	.1	.20	.03	.00	.15	.00	1.72	13610.00
243.8	246.9	.00	.33	.1	.25	.02	.03	.00	.00	1.85	13611.00
246.9	249.9	.00	.11	.0	.10	.03	.01	.02	.00	2.84	13612.00
249.9	253.0	.00	.16	.1	.18	.02	.01	.02	.01	2.84	13613.00
253.0	256.0	.00	.02	.2	.05	.02	.01	.13	.00	3.76	13614.00
256.0	259.1	.01	.00	~~31.0~~	.10	.06	.06	1.77	.05	3.11	13615.00
259.1	261.1	.00	.02	1.0	.11	.01	.00	.00	.00	1.76	13616.00
261.1	262.1	.00	.03	1.7	.19	.02	.00	.00	.00	1.95	13617.00
262.1	265.2	.00	.05	.5	.12	.02	.00	.00	.01	1.94	13618.00
265.2	268.2	.00	.03	.0	.08	.03	.00	.07	.00	3.17	13619.00
268.2	271.3	.00	.05	.2	.15	.12	.04	2.51	.00	2.88	13620.00
271.3	274.3	.00	.07	.0	.09	.00	.00	.00	.00	2.67	13621.00
274.3	277.4	.00	.02	.0	.05	.02	.01	.16	.00	2.60	13622.00
277.4	280.4	.00	.02	.0	.03	.01	.01	.05	.00	3.04	13623.00
280.4	282.5	.00	.02	.0	.02	.01	.01	.01	.00	1.69	13624.00
282.5	283.5	.00	.06	16.6	.05	.04	.00	.00	.08	5.98	13625.00
283.5	284.7	.00	.03	.8	.04	.04	.01	.00	.11	3.12	13626.00
284.7	286.5	.00	.03	.3	.06	.01	.00	.00	.00	2.10	13627.00
286.5	289.6	.00	.05	.1	.09	.02	.01	.00	.02	2.06	13628.00
289.6	292.6	.00	.06	.0	.08	.01	.00	.00	.00	2.06	13629.00
292.6	295.7	.00	.03	.1	.08	.01	.08	.00	.00	2.04	13630.00
295.7	298.7	.00	.05	1.5	.11	.04	.11	.00	.00	2.33	13631.00
298.7	301.8	.00	.02	.3	.05	.02	.00	.00	.00	1.29	13632.00

*** LAC MINERALS LTD. ***
*** LAC BILLITON TIN PROJECT ***

301.8	304.8	.01	.04	1.3	.07	.02	.01	.00	.19	1.52	13633.00
304.8	307.8	.03	.04	8.7	.10	.03	.01	.00	.21	1.38	13634.00
307.8	310.9	.10	.06	.9	.10	.10	.02	.00	.36	1.25	13635.00
310.9	313.9	.05	.03	1.6	.11	.11	.01	.00	.24	1.76	13636.00
313.9	317.0	.01	.04	1.1	.14	.04	.01	.00	.15	1.61	13637.00
317.0	320.0	.27	.22	2.1	.29	.07	.04	.00	.80	1.91	13638.00
320.0	323.1	.12	.17	2.6	.36	.21	.02	.00	.39	1.79	13639.00
323.1	326.1	.04	.15	1.1	.18	.10	.01	.00	.23	1.49	13640.00
326.1	329.2	.06	.17	1.0	.15	.16	.01	.00	.24	1.58	13641.00
329.2	332.2	.21	.07	.6	.09	.06	.03	.00	.54	2.13	13642.00
332.2	335.3	.05	.07	.4	.10	.04	.01	.00	.25	3.76	13643.00
335.3	338.3	.14	.05	1.0	.11	.08	.02	.00	.39	1.57	13644.00
338.3	341.4	.03	.03	.9	.07	.10	.01	.00	.17	2.54	13645.00
341.4	344.4	.10	.02	1.3	.09	.04	.01	.00	.28	2.29	13646.00
344.4	347.5	.03	.02	2.3	.24	.02	.00	.00	.05	3.38	13647.00
347.5	350.5	.00	.01	.1	.02	.01	.00	.00	.06	4.83	13648.00
350.5	353.6	.00	.02	.0	.04	.02	.00	.00	.02	6.62	13649.00
353.6	356.6	.00	.02	.0	.03	.01	.00	.00	.05	6.02	13650.00
356.6	359.7	.31	.03	.0	.32	.05	.03	.00	.59	3.45	13651.00
359.7	362.7	.06	.04	.2	.06	.05	.01	.00	.22	5.07	13652.00
362.7	365.8	.00	.06	.8	.18	.02	.00	.00	.00	5.42	13653.00
365.8	368.8	.00	.03	.1	.03	.01	.00	.00	.00	3.74	13654.00
368.8	371.9	.07	.07	.1	.05	.01	.01	.00	.26	4.68	13655.00
371.9	374.9	.03	.07	.4	.09	.10	.01	.20	.09	4.44	13656.00
374.9	376.4	.00	.05	.0	.03	.01	.00	.00	.00	5.50	13657.00
376.4	378.0	.29	.09	.2	.04	.17	.04	.25	.86	10.78 ****	13658.00
378.0	381.0	.03	.04	.0	.04	.06	.01	.11	.27	10.71 ****	13659.00
381.0	384.0	.00	.04	.1	.04	.01	.00	.00	.01	4.58	13660.00
384.0	387.0	.00	.03	.0	.02	.02	.00	.00	.14	6.73	13661.00
387.0	390.1	.00	.02	.0	.02	.01	.01	.00	.00	4.25	13662.00
390.1	393.2	.00	.01	.0	.00	.01	.00	.00	.00	3.57	13663.00
393.2	396.2	.00	.00	.1	.01	.01	.00	.00	.00	3.86	13664.00
396.2	399.3	.00	.01	.0	.01	.00	.00	.00	.08	7.04	13665.00
399.3	402.3	.43	.03	.1	.06	.05	.04	.00	.99	9.22	13666.00
402.3	405.4	.11	.03	.0	.03	.01	.02	.00	.47	11.79 ****	13667.00
405.4	408.4	.00	.01	.0	.00	.02	.00	.00	.00	5.78	13668.00
527.3	530.4	.00	.01	.0	.01	.02	.00	.00	.02	3.35	13669.00
530.4	533.4	.00	.02	.0	.00	.01	.01	.00	.06	3.38	13670.00
533.4	536.4	.00	.01	.0	.01	.01	.01	.00	.00	4.21	13671.00

Table V

PC-XPLOR VERSION 1.20 GEOPLOT INC.
Exploration Data Manager Serial no: 20000
By GEMCOM SERVICES INC. 23/12/88 Page : 14
*** LAC MINERALS LTD. ***
*** LAC BILLITON TIN PROJECT ***

HOLE-ID: LNZ-16

EASTING: 15900.0 NORTHING:13000.0 ELEVATION: 1300.0
LENGTH: 593.4
LITHOLOGY DATA

FROM	TO	ROCK TYPE	REMARKS
.0	3.0		
3.0	8.8	MIX	QFP
8.8	13.2	STW	QFP
13.2	16.7	MIX	QFP
16.7	16.7	BX-DYKE	BX-DYKE
16.7	24.4	MIX	QFP
24.4	26.5	STW	QFP
26.5	27.1	BX-DYKE	BX-DYKE
27.1	30.6	MIX	QFP
30.6	31.6	BX-DYKE	BX-DYKE
31.6	34.0	MIX	QFP
34.0	34.3	BX-DYKE	BX-DYKE
34.3	37.6	MIX	QFP
37.6	41.5	BX	SEDS
41.5	45.7	MIX	QFP
45.7	48.8	STW	QFP
48.8	76.2	MIX	QFP
76.2	85.3	STW	QFP
85.3	88.4	MIX	QFP
88.4	100.9	STW	QFP
100.9	107.7	MIX	QFP
107.7	118.7	STW	QFP
118.7	134.1	MIX	QFP
134.1	137.2	STW	QFP
137.2	152.1	MIX	QFP
152.1	155.2	STW	QFP
155.2	160.0	MIX	QFP
160.0	160.6	VEIN/REPL'S	VEIN/REPL'S
160.6	164.0	SIL/CHL	QFP
164.0	165.3	VEIN/REPL'S	VEIN/REPL'S
165.3	168.1	MIX	QFP
168.1	170.7	STW	QFP
170.7	179.8	MIX	QFP
179.8	183.4	STW	QFP
183.4	187.3	SIL/CHL	QFP
187.3	188.1	VEIN/REPL'S	VEIN/REPL'S
188.1	195.1	SIL/CHL	QFP
195.1	201.2	CHL	QFP
201.2	207.3	MIX	QFP
207.3	218.2	STW	QFP
218.2	222.5	SIL	QFP
222.5	225.6	MIX	QFP
225.6	237.0	STW	QFP
237.0	238.6	SIL	QFP
238.6	265.2	STW	QFP
265.2	266.4	MIX	QFP

266.4	267.2	REPL ZONE	REPL ZONE
267.2	274.3	MIX	QFP
274.3	275.8	REPL ZONES	REPL ZONES
275.8	280.9	MIX	QFP
280.9	281.6	REPL ZONES	REPL ZONES
281.6	289.6	MIX	QFP
289.6	305.4	STW	QFP
305.4	310.6	SIL/CHL	QFP
310.6	317.0	STW	QFP
317.0	332.2	MIX	QFP
332.2	338.3	STW	QFP
338.3	341.4	MIX	QFP
341.4	349.1	STW	QFP
349.1	351.3	STW	GR-DYKE
351.3	356.3	MIX	QFP
356.3	360.9	STW	QFP
360.9	366.1	SIL/STW	QFP
366.1	366.5	GR-DYKES	GR-DYKES
366.5	376.6	MIX	QFP
376.6	377.6	STW	GR-DYKES
377.6	381.0	MIX	QFP
381.0	384.0	STW	QFP
384.0	387.1	MIX	QFP
387.1	393.0	CHL/STW	QFP
393.0	393.1	GR-DYKE	GR-DYKE
393.1	396.5	MIX	QFP
396.5	3298.1	CHL	BX
3298.1	408.4	MIX	QFP
408.4	414.5	SIL	QFP
414.5	420.6	MIX	QFP
420.6	423.7	CHL	QFP
423.7	433.3	MIX	QFP
433.3	434.2	STW	GR-DYKE
434.2	436.9	SIL/CHL	QFP
436.9	437.1	GR-DYKE	GR-DYKE
437.1	440.4	MIX	QFP/GR-DYKES
440.4	451.1	MIX	GRII
451.1	454.5	STW	GRII
454.5	457.9	SIL/CHL	GRII
457.9	467.9	STW	GRII
467.9	468.3	STW	PG-DYKE
468.3	472.4	STW	GRII
472.4	475.5	MIX	GRII
475.5	481.6	STW	GRII
481.6	485.2	MIX	GRII
485.2	485.7	REPL-ZONE	REPL-ZONE
485.7	493.9	MIX	GRII
493.9	498.5	REPL-ZONES	REPL-ZONES
498.5	507.2	MIX	GRII
507.2	511.1	REPL-ZONES	REPL-ZONES
511.1	520.6	MIX	GRII
520.6	521.0	REPL-ZONE	REPL-ZONE
521.0	524.0	MIX	GRII
524.0	525.0	REPL-ZONES	REPL-ZONES

525.0	527.5	MIX	GRII
527.5	528.2	REPL-ZONES	REPL-ZONES
528.2	532.0	MIX	GRII
532.0	533.7	REPL-ZONES	REPL-ZONES
533.7	539.5	SIL/CHL	GRII
539.5	545.3	REPL-ZONE	REPL-ZONE
545.3	548.3	SIL/CHL	GRII
548.3	548.9	REPL-ZONE	REPL-ZONE
548.9	552.5	CHL/STW	GRII
552.5	562.8	STW	GRIII
562.8	571.2	MIX	GRIII
571.2	593.4	STW	GRIII
.0	.0	0.00	0.00

SAMPLE DATA

FROM	TO	WO3	MOS2	AS	BI	CU	PB	ZN	Sn	FE	SAMPLE#
185.9	189.8	.06	.02	.0	.03	.14	.04	2.05	~~.08~~ .25	7.78	13672.00
265.2	268.2	.02	.28	.3	.11	.04	.13	.00	.08	6.44	13673.00
432.8	435.9	.04	.00	.0	.00	.00	.02	.00	.21	4.02	13674.00
488.0	490.7	.00	.00	.0	.01	.01	.00	.00	.00	3.45	13675.00
490.7	493.8	.00	.00	.0	.00	.01	.00	.00	.01	2.71	13676.00
493.8	496.8	.00	.00	.0	.00	.01	.01	.00	.11	2.13	13677.00
496.8	499.9	.00	.00	.0	.00	.00	.01	.00	.17	1.94	13678.00
499.9	502.9	.00	.01	.0	.00	.01	.00	.00	.00	2.42	13679.00
502.9	506.0	.00	.00	.0	.00	.01	.00	.00	.00	2.33	13680.00
506.0	509.0	.00	.04	.0	.00	.01	.00	.00	.01	7.84	13681.00
509.0	512.1	.00	.00	.0	.00	.01	.00	.00	.00	5.26	13682.00
512.1	515.1	.00	.01	.0	.01	.02	.01	.00	.00	3.46	13683.00
515.1	518.2	.00	.00	.0	.00	.01	.00	.00	.00	3.42	13684.00
518.2	521.2	.00	.00	.0	.00	.01	.00	.00	.02	4.88	13685.00
521.2	524.3	.00	.00	.0	.00	.02	.01	.00	.00	4.84	13686.00
524.3	527.3	.00	.00	.0	.01	.01	.01	.01	.00	3.61	13687.00
527.3	529.4	.00	.00	.0	.00	.01	.00	.00	.00	4.07	13688.00
529.4	530.4	.00	.00	.0	.00	.01	.00	.00	.00	2.34	13689.00
530.4	533.4	.00	.04	.0	.01	.00	.01	.00	.16	**** 16.97	13690.00
533.4	534.0	.23	.00	.0	.00	.01	.04	.05	.85	**** 10.53	13691.00
534.0	536.4	.00	.00	.0	.01	.01	.00	.00	.00	6.76	13692.00
536.4	539.5	.00	.00	.0	.00	.00	.00	.05	.00	**** 20.48	13693.00
539.5	542.5	.00	.00	.0	.00	.00	.00	.09	.00	**** 23.19	13694.00
542.5	545.6	.00	.00	.0	.00	.00	.00	.07	.00	**** 17.69	13695.00
545.6	548.9	.21	.00	.0	.00	.00	.03	.01	.66	7.24	13696.00
548.9	551.7	.00	.00	.0	.00	.01	.00	.00	.00	5.23	13697.00
551.7	552.5	.00	.00	.0	.00	.01	.00	.00	.00	1.55	13698.00
552.5	554.7	.00	.00	.0	.00	.01	.00	.00	.00	1.25	13699.00
554.7	557.8	.00	.00	.0	.00	.01	.00	.00	.00	1.46	13700.00
557.8	560.8	.00	.00	.0	.00	.01	.00	.00	.00	1.25	13701.00
560.8	563.0	.00	.00	.0	.00	.01	.00	.00	.00	1.79	13702.00
563.0	563.9	.00	.00	.0	.00	.01	.01	.00	.10	3.28	13703.00
563.9	566.9	.00	.00	.0	.00	.01	.01	.01	.15	3.08	13704.00
566.9	567.0	.25	.00	.0	.00	.01	.04	.00	.74	3.11	13705.00
567.0	571.2	.41	.00	.0	.00	.01	.05	.00	1.05	2.93	13706.00
571.2	573.0	.00	.00	.0	.00	.01	.00	.00	.00	.91	13707.00
573.0	576.1	.00	.00	.0	.00	.00	.00	.00	.00	1.17	13708.00

PC-XPLOR VERSION 1.20 GEOPLOT INC.
Exploration Data Manager Serial no: 20000
By GEMCOM SERVICES INC. 23/12/88 Page : 17
*** LAC MINERALS LTD. ***
*** LAC BILLITON TIN PROJECT ***

HOLE-ID: LNZ-17

EASTING: 15700.0 NORTHING:13000.0 ELEVATION: 1280.0
LENGTH: 535.5
LITHOLOGY DATA

FROM	TO	ROCK TYPE	REMARKS
.0	4.0		
4.0	6.1	STW	QFP
6.1	16.2	MIX	QFP
16.2	16.3	SIL	BX-DYKE
16.3	19.4	MIX	QFP
19.4	19.5	CHL	BX-DYKE
19.5	30.5	SIL	QFP
30.5	32.4	MIX	QFP
32.4	32.7	SIL	BX-DYKE
32.7	34.7	MIX	QFP
34.7	35.0	SIL	BX-DYKES
35.0	42.7	MIX	QFP
42.7	46.1	BX	QFP
46.1	61.0	BX	SEDS
61.0	66.8	BX	QFP
66.8	86.6	MIX	QFP
86.6	87.0	SIL	BX-DYKE
87.0	89.6	MIX	QFP
89.6	89.6	SIL/CHL	BX-DYKE
89.6	106.6	MIX	QFP
106.6	109.7	SIL/CHL	QFP
109.7	115.8	MIX	QFP
115.8	120.4	SIL/CHL	QFP
120.4	122.1	BX	QFP
122.1	128.9	CHL	QFP
128.9	129.1	SIL	DYKE
129.1	134.4	SIL/CHL	QFP
134.4	138.3	STW	QFP
138.3	155.8	MIX	QFP
155.8	170.0	SIL/CHL	QFP
170.0	170.3	SIL	PEB-DYKE
170.3	177.5	SIL/CHL	QFP
177.5	183.6	MIX	QFP
183.6	183.9	CHL	BX-DYKE
183.9	198.1	MIX	QFP
198.1	201.2	SIL/CHL	QFP
201.2	206.3	BX	QFP
206.3	213.4	MIX	QFP
213.4	216.4	SIL	QFP
216.4	234.7	MIX	QFP
234.7	237.7	CHL	QFP
237.7	253.7	MIX	QFP
253.7	254.0	CHL	BX-DYKE
254.0	269.2	MIX	QFP
269.2	269.6	GR-DYKES	GR-DYKES
269.6	272.6	MIX	QFP

272.6	275.1	MIX	QFP /GR-DYKES
275.1	286.5	MIX	QFP
286.5	289.9	SIL/CHL	QFP
289.9	290.5	GR-DYKES	GR-DYKES
290.5	294.3	MIX	QFP
294.3	294.7	SIL	PEB-DYKE
294.7	298.7	STW	QFP
298.7	303.6	MIX	QFP
303.6	303.8	GR-DYKES	GR-DYKES
303.8	307.1	MIX	QFP
307.1	307.3	GR-DYKES	GR-DYKES
307.3	310.8	MIX	QFP
310.8	311.5	PG-DYKE	PG-DYKE
311.5	313.8	MIX	QFP
313.8	314.2	REPL-ZONE	REPL-ZONE
314.2	315.3	MIX	QFP
315.3	315.6	SIL/CHL	PEB-DYKE
315.6	338.5	MIX	QFP
338.5	340.0	STW/CHL	GR-DYKE
340.0	351.3	MIX	QFP
351.3	352.6	STW/CHL	GR-DYKE
352.6	356.5	CHL	QFP
356.5	357.0	CHL	GR-DYKE
357.0	360.0	CHL/STW	QFP
360.0	361.3	CHL/STW	QFP/GR-DYKES
361.3	372.1	CHL/STW	QFP
372.1	373.3	REPL-ZONE	REPL-ZONE
373.3	375.3	MIX	QFP
375.3	376.9	REPL-ZONE	REPL-ZONE
376.9	385.0	MIX	QFP
385.0	385.7	MIX	GR-DYKE
385.7	388.6	MIX	QFP
388.6	389.5	MIX	QFP/GR-DYKES
389.5	391.0	MIX	QFP
391.0	391.4	APL-DYKE	APL-DYKE
391.4	395.6	MIX	QFP
395.6	397.0	SIL/CHL	GRII
397.0	398.8	REPL-ZONES	REPL-ZONES
398.8	402.3	STW	GRII
402.3	408.4	SIL/CHL	GRII
408.4	414.5	MIX	GRII
414.5	421.0	CHL	GRII
421.0	421.3	REPL-ZONE	REPL-ZONE
421.3	424.5	CHL	GRII
424.5	425.0	REPL-ZONE	REPL-ZONE
425.0	432.4	SIL/CHL	GRII
432.4	435.9	CHL/STW	GRII
435.9	442.3	MIX	GRII
442.3	443.0	REPL-ZONE	REPL-ZONE
443.0	451.1	MIX	GRII
451.1	454.2	STW	GRII
454.2	454.3	APL-DYKE	APL-DYKE
454.3	479.5	STW	GRII
479.5	494.7	MIX	GRII

PC-XPLOR VERSION 1.20 — GEOPLOT INC.
Exploration Data Manager — Serial no: 20000
By GEMCOM SERVICES INC. — 23/12/88 — Page : 19

*** LAC MINERALS LTD. ***
*** LAC BILLITON TIN PROJECT ***

494.7	506.0	SIL/CHL	GRIII
506.0	521.5	GRIII	GRIII
521.5	523.2	SIL/CHL	GRIII
523.2	529.0	GRIII	GRIII
529.0	531.3	SIL/CHL	GRIII
531.1.0	535.5.0	0.00 MIX	0.00

SAMPLE DATA

FROM	TO	WO3	MOS2	AS	BI	CU	PB	ZN	Sn	FE	SAMPLE#
30.5	33.5	.00	.00	.1	.00	.02	.04	.03	.00	4.00	13709.00
61.0	64.0	.12	.00	.2	.00	.52	1.27	3.71	.41	4.70	13710.00
91.4	94.5	.00	.01	.1	.01	.05	.13	.65	.01	4.33	13711.00
121.9	125.0	.00	.01	.1	.02	.03	.10	.18	.04	6.77	13712.00
152.4	155.4	.00	.05	.2	.04	.03	.03	.19	.00	4.00	13713.00
183.0	185.9	.00	.08	.3	.04	.02	.01	.00	.00	7.48	13714.00
213.4	216.4	.08	.22	~~1.2~~	.35	.02	.04	.12	.04	1.25	13715.00
243.8	246.9	.00	.29	.2	.17	.02	.06	.00	.00	3.37	13716.00
274.3	277.4	.00	.24	.1	.07	.01	.02	.00	.01	4.61	13717.00
304.8	307.8	.00	.04	.0	.04	.01	.03	.00	.00	2.47	13718.00
3335.3	338.3	.00	.02	.0	.01	.02	.02	.08	.00	3.30	13719.00
338.3	341.4	.00	.02	.0	.01	.01	.03	.13	.00	3.35	13720.00
341.4	344.4	.00	.01	.0	.00	.02	.03	.10	.00	4.37	13721.00
344.4	347.5	.00	.02	.0	.00	.02	.01	.11	.00	4.10	13722.00
347.5	350.5	.00	.02	.0	.00	.02	.01	.18	.00	4.34	13723.00
350.5	353.6	.16	.00	.0	.00	.03	.02	.03	.39	5.18	13724.00
353.6	356.6	.08	.02	.0	.00	.02	.05	.12	.27	5.63	13725.00
356.6	359.7	.00	.01	.0	.00	.02	.12	.31	.02	5.00	13726.00
359.7	362.7	.00	.01	.0	.00	.01	.03	.12	.00	4.16	13727.00
362.7	365.8	.00	.04	.0	.00	.01	.03	.00	.00	3.30	13728.00
365.8	368.8	.00	.02	.0	.01	.02	.01	.06	.00	4.07	13729.00
368.8	371.9	.00	~~.02~~.03	.0	~~.01~~.00	~~.00~~.01	.01	~~.01~~.07	~~.02~~.00	~~.06~~ 3.64	13730.00
371.9	374.9	.00	.05	.0	.00	.04	.02	.10	.00	9.36	13731.00
374.9	378.0	.40	.04	.1	.04	.58	.04	2.09	.80	6.63	13732.00
378.0	381.0	.00	.01	.0	.04	.01	.01	.07	.00	2.93	13733.00
411.5	414.5	.00	.03	.0	.01	.02	.01	.00	.02	3.91	13734.00
414.5	417.6	.00	.01	.0	.00	.01	.00	.00	.00	9.63	13735.00
417.6	420.6	.00	.01	.0	.02	.02	.00	.26	.00	5.66	13736.00
420.6	423.7	.13	~~.03~~.02	.0	.16	.01	.01	.00	.14	~~****~~ 1.16	13737.00
423.7	426.7	.00	.00	.0	.03	.01	.00	.00	.00	8.76	13738.00
426.7	429.8	1.40	.21	.0	.15	.02	.02	.00	.12	5.08	13739.00
457.2	460.2	.00	.02	.0	.00	.01	.00	.00	.00	2.23	13740.00

STATEMENT OF EXPENDITURES

Project 8714-21G7

Year to December 31, 1988

Salaries and wages	$14,190.78
Diamond drilling	157,040.80
Assays and core handling	4,563.93
Storage	1,398.00
Telephone, telegraph, telex	49.07
Courier, freight	564.73
Total	$177,807.31

Enclosures

Diamond drill contractor invoices

Longyear Canada Inc.
CONTRACT DRILLING DIVISION
P.O. Box 330, North Bay, Ontario, Canada P1B 8H6
Telephone: 705-474-2800
Telex: 067-76194 Cable: Longyear
Fax: 705-474-2373

Lac Minerals Limited,
P.O. Box 150,
St. George, New Brunswick.
E0G 2Y0.

Invoice No. 3558
Cust. No. 2107
Job No. 2184
Dest. 065

Invoice date August 30, 1988
for August 1988

To: Invoice for diamond drilling performed on mining properties located near Mount Pleasant Tungsten Mine (MPT) during the period Aug. 2 To Aug. 14, 1988 per agreement dated May 24, 1988

HOLE NO.	SIZE	FROM	TO	TOTAL	RATE	AMOUNT
LNZ-15	NQ Wireline	0	204.83m	204.83m	49.50	10,139.09
	BQ Wireline	204.83m	277.37m	72.54m	44.00	3,191.76
				277.37m		13,330.85

Long Waterlines
Hole LNZ-15

15 Hrs. @ 70.00 — 1,050.00

Hole Conditions
Hole LNZ-15

19 Hrs. @ 70.00		1,330.00	
2 - BQ W/L Shell # 03762 & 03763 @ 302.00	604.00		
3 - BQ Imp Bits # 9, 04257, 04259 & 04262 @ 450.00	1,350.00		
1 - BQ Imp Bit # 8 # 85051	430.00		
2 - BQ Econo Shells E1701,E180 @ 165.00	330.00		
1 - BQ Outer Tube	270.00		
1 - BQ Inner Tube	65.80		
	3,049.80		
Plus: 15%	457.47		
		3,507.27	
			4,837.27

Longyear Canada Inc.
CONTRACT DRILLING DIVISION
P.O. Box 330, North Bay, Ontario, Canada P1B 8H6
Telephone: 705-474-2800
Telex: 067-76194 Cable: Longyear
Fax: 705-474-2373

Lac Minerals Limited -2- Invoice 3558

Cementing			
Hole LNZ-15			
76 Hrs. @ 70.00		5,320.00	
32 Extra Crew Hrs. @ 28.00		896.00	
1 - NQ Bit # 03479 #2 Ext. Crown	500.00		
1 - NQ Econo Shell # E1302	205.00		
1 - BQ VK Grout Plug	65.00		
	770.00		
Plus: 15%	115.50		
		885.50	
			7,101.50
Hole Reduction			
Hole LNZ-15			
8 Hrs. @ 70.00			560.00
Tropari Rental			
August 1 - August 14, 1988			
14/31 @ 500.00			225.81
			$27,105.43

TERMS – NET 30 DAYS – INTEREST CHARGED AT 1 1/2% PER MONTH ON OVERDUE ACCOUNTS

Longyear Canada Inc.
CONTRACT DRILLING DIVISION
P.O. Box 330, North Bay, Ontario, Canada P1B 8H6
Telephone: 705-474-9800
Telex: 067-76194 Cable: Longyear
Fax: 705-474-2373

Lac Minerals Ltd.
P. O. Box 150
St. George, New Brunswick
EOG 2Y0

Invoice No.: 3559
Cust. No.: 2107
Job No.: 2184
Dest.: 065
Invoice Date: September 22, 1988
For August 1988

TO: Invoice for diamond drilling performed on mining properties located near the Mount Pleasant Tungsten Mine (MPT) during the period August 15 to August 23, 1988 per Agreement dated May 24, 1988.

Hole #	Size	From	To	Total	Rate	Amount
LNZ-15	BQ Wireline	277.37m	285.60m	8.23m	44.00	362.12
LNZ-16	NQ Wireline	0	285.60m	285.60m	49.50	14137.20
				293.83m		$14499.32

Long Waterlines
Hole LNZ-16

4 1/2 Hours @ $70.00 — 315.00

Hole Conditions
Hole LNZ-15

30 Hours @ $70.00 — 2100.00

Hole LNZ-16

21 Hours @ $70.00 — 1470.00

3570.00

Cementing

16 Hours @ $70.00 — 1120.00
1-BQ Bit Ser. #2 #73930 — 340.00
1-BQ Econo Shell #E3955 — 165.00
505.00
Plus 15% — 75.75
580.75

1700.75

.../2

Longyear Canada Inc.
CONTRACT DRILLING DIVISION
P.O. Box 330, North Bay, Ontario, Canada P1B 8H6
Telephone: 705-474-9800
Telex: 067-76194 Cable: Longyear
Fax: 705-474-9373

PAGE 2 - CONTINUED

Left In Hole		
Hole LNZ-15		
1 - NW 10' Casing	137.85	
1 - NW Econo Shoe E1600	160.00	
		297.85
Reaming		
Hole LNZ-16		
3 Hours @ $70.00		210.00
Moves		
From Hole LNZ-15 to Hole LNZ-16		
13 Hours @ $70.00	910.00	
18 Extra Crew Hours @ $28.00	504.00	
6 Tractor Hours @ $40.00	240.00	
		1654.00
Mud and Rods From Moncton		
4 Hours @ $70.00	280.00	
9 Extra Crew Hours @ $28.00	252.00	
1 Tractor Hour	40.00	
9 Truck Float Hours @ $40.00	360.00	
		932.00
Mud & Additives		
Alan Hait Invoice	57.00	
60 Gallons Diesel Fuel @ $2.16	129.60	
38 Bags Quick-Gel @ $13.47	511.86	
27 Bags Quick-Trol @ $13.04	352.08	
1 Pail G. Stop	See Later Invoice	
	1050.54	
Plus 15%	157.58	
		1208.12
Tropari Rental		
August 15 - 23, 1988 9/31 x $500.00		145.16
		$24532.20

TERMS – NET 30 DAYS – INTEREST CHARGED AT 1 1/2% PER MONTH ON OVERDUE ACCOUNTS

Longyear Canada Inc.
CONTRACT DRILLING DIVISION
P.O. Box 330, North Bay, Ontario, Canada P1B 8H6
Telephone: 705-474-9800
Telex: 067-76194 Cable: Longyear
Fax: 705-474-9373

ORIGINAL

Lac Minerals Limited,
P.O. Box 150,
St. George, New Brunswick.
E0G 2Y0.

Invoice No. 3702
Cust. No. 2107
Job No. 2184
Dest. U65

Invoice date September 22, 1988
for September 1988

To: Invoice for diamond drilling performed on mining properties located near the Mount Pleasant Tungsten Mine (MPT) during the period August 24 to September 11, 1988 per agreement dated May 24, 1988

HOLE NO.	SIZE	FROM	TO	TOTAL	RATE	AMOUNT
LNZ-16	NQ Wireline	285.60m	300.00m	14.40m	49.50	712.80
	NQ Wireline	300.00m	593.45m	293.45m	51.85	15,215.38
LNZ-17	NQ Wireline	0	245.97m	245.97m	49.50	12,175.52
				553.82m		28,103.70

Hole Conditions
Hole LNZ-16
31 Hours @ $70.00 — 2,170.00

Hole LNZ-17
28 1/2 Hrs. @ $70.00 — 1,995.00
1 1/2 Tractor Hrs. @ $40.00 — 60.00
2,055.00
4,225.00

Mud and Additives
Westcoat Drilling Supplies Limited — 1,530.06
222 Bags Quick Get - (See Later Invoice)
74 Bags Quik Trol - (See Later Invoice)
1 Bag Quik Seal - (See Later Invoice)
Plus: 15% — 229.51
1,759.57

Reaming
Hole LNZ-16
4 Hrs. @ $70.00 — 280.00

TERMS – NET 30 DAYS – INTEREST CHARGED AT 1 1/2% PER MONTH ON OVERDUE ACCOUNTS

Longyear Canada Inc.
CONTRACT DRILLING DIVISION
P.O. Box 330, North Bay, Ontario, Canada P1B 8H6
Telephone: 705-474-2800
Telex: 067-76194 Cable: Longyear
Fax: 705-474-9373

Lac Minerals Limited -2- Invoice No. 3702

Moves		
From Hole LNZ-16 to Hole LNZ-17		
15 Hrs. @ $70.00	1,050.00	
9 Tractor Hours @ $40.00	360.00	
		1,410.00
Left In Hole		
2 - NW 5 Ft. Casing @ $80.95	161.90	
1 - NW 2 Ft. Casing	47.00	
1 - NW Econo Shoe # E-1592	160.00	
		368.90
		$36,147.17

Longyear Canada Inc.

Lac Minerals Ltd.
P. O. Box 150
St. George, New Brunswick
EOG 2YO

Invoice No.: 3703
Cust. No.: 2107
Job No.: 2184
Dest.: 065
Invoice Date: October 7, 1988
For September 1988

TO **Invoice for diamond drilling performed on mining properties located near the Mount Pleasant Tungsten Mine (MPT) during the period September 12 to September 30, 1988 per Agreement dated May 24, 1988.**

Hole #	Size	From	To	Total	Rate	Amount
LNZ-17	NQ Wireline	245.97m	300.00m	54.03m	49.50	2674.49
	NQ Wireline	300.00m	404.47m	104.47m	51.85	5416.77
	BQ Wireline	404.47m	535.53m	131.06m	47.70	6251.56
LNZ-15	BQ Wireline	285.60m	300.00m	14.40m	44.00	633.60
	BQ Wireline	300.00m	564.79m	264.79m	47.70	12630.48
				568.75m		$27606.90

Hole Condition:
Hole LNZ-17

58 Hours @ $70.00			4060.00	
1 Tractor Hour			40.00	
1 - NQ 10' Corebarrel (Outer Tube Only)		340.00		
1 - NQ Bit #L24074 #6		490.00		
1 - NQ Econo Shell E1292		205.00		
35 - NQ 10' Rods @ $120.00	4200.00			
Less 50%	(2100.00)			
		2100.00		
		3135.00		
Plus 15%		470.25		
			3605.25	
				7705.25

.../2

Longyear Canada Inc.

Lac Minerals Ltd.
PAGE 2 - CONTINUED

Hole LNZ-15

21 1/2 Hours @ $70.00	1505.00		
11 1/2 Man Hours @ $28.00	322.00		
1/2 Hour Tractor Hours @ $40.00	20.00		
		1847.00	
			9552.25
Mud & Additives			
342 Gallons Diesel Fuel @ $2.16		738.72	
Canadian Pipe Supply Ltd.		14737.48	
Air Canada Express		310.80	
Day & Ross		1902.80	
		17689.80	
Less: 38 Bags Quick-Gel @ $13.47 (Inv. 3559)	(511.86)		
27 Bags Quick-Trol @ $13.04 (Inv. 3559)	(352.08)		
		(863.94)	
		16825.86	
Plus 15%		2523.88	
			19349.74
Moves:			
From Hole LNZ-17 to Hole LNZ-15			
16 Hours @ $70.00		1120.00	
32 Extra Crew Hours @ $28.00		896.00	
9 Tractor Hours @ $40.00		360.00	
			2376.00
Tropari Rental			
August 24 - 31, 1988 8/31 @ $500.00		129.03	
September 1 - 30, 1988		500.00	
			629.03
Left in Hole			
Hole LNZ-17			
1 NW Shoe E1593			160.00
			$59673.92
			========

... INTEREST CHARGED AT ... PER MONTH ON OVERDUE ACCOUNTS

Geological setting of granites and related tin deposits in the North Zone, Mount Pleasant, New Brunswick

W. David Sinclair, Gustaaf J.A. Kooiman,[1] and David A. Martin[1]
Mineral Resources Division

Sinclair, W.D., Kooiman, G.J.A., and Martin, D.A.; Geological setting of granites and related tin deposits in the North Zone, Mount Pleasant, New Brunswick; in Current Research, Part B, Geological Survey of Canada, Paper 88-1B, p. 201-208, 1988.

Abstract

Granitic intrusions and associated mineral deposits at Mount Pleasant were emplaced in a subvolcanic environment near the southwestern margin of the Mount Pleasant caldera. Mineral deposits in the North Zone are associated with three phases of granite. Tungsten-molybdenum deposits apear to be related to the oldest phase (Granite I). Most tin deposits are within, or adjacent to, an intermediate phase (Granite II). The youngest phase (Granite III) has only minor associated tin zones. Textural features of Granite II, such as miarolitic cavities and comb quartz layers, are characteristic of fluid saturation in the parent magma. Other features such as micrographic intergrowths of quartz and K-feldspar reflect undercooled conditions that may have been related to rapid release of a fluid phase (i.e. pressure quenching). The association of the tin deposits with granite containing these features indicates that a significant portion of the mineralizing fluids were magmatic.

Résumé

Les intrusions granitiques et les gisements de minéraux associés que l'on trouve sur les lieux du mont Pleasant ont été mis en place dans un milieu subvolcanique près de la marge sud-ouest de la caldeira de Pleasant Mount. Les gisements de minéraux de la zone nord sont associés à trois phases de granite. Des gisements de tungstène et molybdène semblent être apparentés à la phase la plus ancienne (Granite I). La plupart des gisements d'étain se trouvent à l'intérieur ou contigus à une phase intermédiaire (Granite II). La phase la plus récente (Granite III) ne possède que de petites zones d'étain connexes. Les éléments texturaux de Granite II, comme les cavités miarolithiques et les couches de quartz à épontes fortement minéralisées et presque jointives, sont caractéristiques d'une phase de saturation fluide au sein du magma originel. D'autres particularités comme les intercroissances micrographiques de quartz et de feldspath potassique reflètent des conditions de sous-refroidissement qui peuvent avoir été liées à la libération rapide d'une phase fluide (c'est-à-dire la trempe sous pression). L'association des gisements d'étain au granite renfermant ces éléments révèle qu'une partie appréciable des fluides minéralisateurs sont d'origine magmatique.

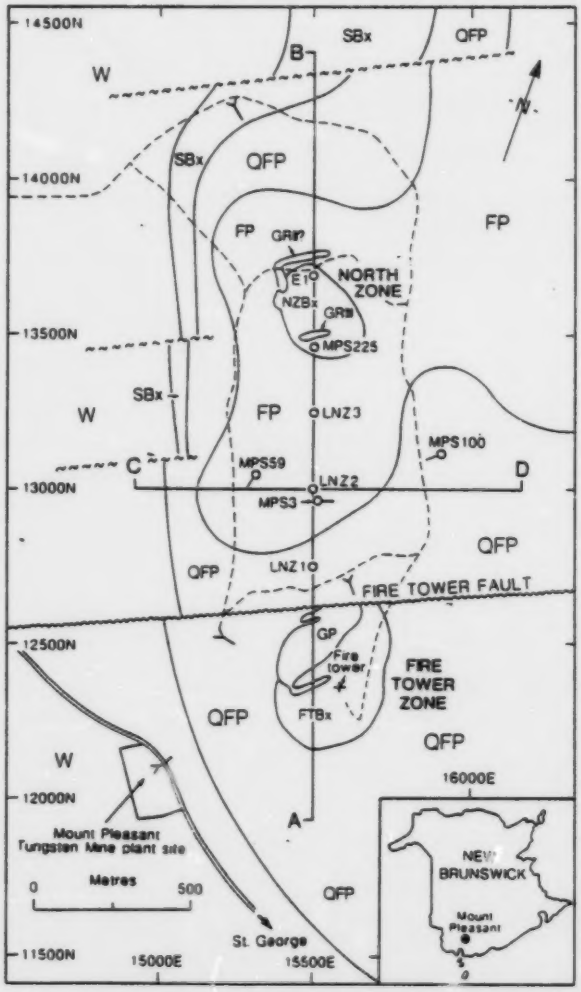
[1] Lac Minerals Ltd., Lac-Billiton Tin Project, P.O. Box 150, St. George, New Brunswick E0G 2Y0

INTRODUCTION

Recent exploration and underground development of tin deposits in Billiton Metals Canada Inc.'s North Zone at Mount Pleasant has been carried out by Lac Minerals Ltd. ;(who are earning a 50% interest in the project). This work has outlined at least three distinct phases of granite designated Granite I, Granite II and Granite III. Some of these phases may be correlative with phases in the Fire Tower Zone previously defined by Kooiman et al. (1986). The nature of the various granitic phases and their relationship to tungsten-molybdenum and tin deposits is the subject of continuing research by the first author. This paper summarizes the geological setting of the Mount Pleasant intrusions and associated tin deposits in the North Zone, incorporating the results of recent exploration and re-examination of core drilled in the 1960s and 1970s by previous operators.

GENERAL GEOLOGY

Granitic intrusions and associated deposits at Mount Pleasant were emplaced in Late Devonian or Early Carboniferous time along the southwestern margin of the Mount Pleasant caldera (Fig. 1). They have intruded intracaldera volcanic and sedimentary rocks of the Piskahegan Group, recently dated as Late Devonian (McCutcheon, 1986). At Mount Pleasant, the Piskahegan Group consists of at least three felsic ash-flow tuff units, a felsic to intermediate flow and two conformable interlayers of sedimentary breccia. In the Mount Pleasant area, the Piskahegan Group rocks generally dip about 10 to 15° to the northwest except along the margin of the caldera where they dip at 15 to 50° toward the centre of the caldera. They are bounded to the west by slate and greywacke of the Silurian Waweig Formation which form the southwest boundary of the Mount Pleasant caldera. At least



DEVONIAN AND/OR MISSISSIPPIAN
NORTH ZONE

- GRIII — Granite III
- GRII — Granite II
- GRI — Granite I
- NZBx — North Zone breccia

FIRE TOWER ZONE

- PG — Porphyritic granite
- GP — Granite porphyry
- FG — Fine grained granite
- FTBx — Fire Tower breccia

LATE DEVONIAN
PISKAHEGAN GROUP

- FP — Feldspar porphyry
- QFP — Quartz - feldspar porphyry
- SBx — Sedimentary breccia

SILURIAN

- W — Waweig Formation: slate and greywacke

Geological boundary (defined, approximate, gradational)
Fault (defined, approximate)
Diamond - drill hole (vertical, inclined, on section, extrapolated to section)
Adit or decline
Mineralized zone
All weather road
Bush road

Figure 1. Surface geological map of the Mount Pleasant area (modified from Ruitenberg, 1967 and McCutcheon, 1983).

two sets of faults are present. One set trends 070° and includes the Fire Tower fault (Fig. 1). Another set trending approximately northwest is prominent in the North Zone but is not well documented.

Quartz-feldspar porphyry

The three ash-flow units now recognized at Mount Pleasant have been referred to collectively in the past as "quartz-feldspar porphyry" (e.g. Ruitenberg, 1967; Parrish and Tully, 1978; Kooiman et al., 1986). The three units are all similar in appearance and consist of rhyolitic crystal tuff characterized by medium-grained phenocrysts of quartz (15 to 25 % by volume) and pink and white feldspar (10 to 30 %) in a light-grey, microcrystalline matrix. The central parts of the flows are typically massive and structureless; eutaxitic foliation is present in places near the upper and loweer contacts of the flows. Fragments of slate or argillite up to several centimetres across occur locally in the flows near their lower contacts. Where no eutaxitic foliation is present, quartz-feldspar porphyry resembles an intrusive rock and intrusive phases may be present, particularly in the Fire Tower Zone (Kooiman et al., 1986). The quartz-feldspar porphyry exposed at surface is equivalent to McCutcheon's (1983) Little Mount Pleasant Tuff unit which occurs to the east of Mount Pleasant.

Feldspar porphyry

"Feldspar porphyry" is a rhyodacitic unit with abundant mdium- to coarse-grained pink feldspar phenocrysts (20 to 30 % by volume) and minor fine- to medium-grained quartz phenocrysts (less than 5 %) in a brown to grey microcrystalline matrix. The phenocrysts are subhedral to euhedral and unbroken; they do noto exhibit fragmentation characteristic of a tuffaceous origin. Feldspar porphyry is also relatively massive with no obvious primary layering. It appears to overlie quartz-feldspar porphyry conformably but the contact in the vicinity of the North Zone has been obscured by alteration and appears gradational. This unit is thus extrusive and is probably a lava flow rather than a crystal tuff. It is equivalent to the intrusive Feldspar Porphyry unit of McCutcheon (1983).

Sedimentary breccia

The two sedimentary breccia units consist mainly of angular to subrounded, clast-supported fragments of slate or argillite in a fine-grained matrix of similar material. Quartz fragments make up less than 10 % of the breccia and fragments of quartz-feldspar porphyry are rare. All the fragments are unsorted and typically range from 1 to 5 cm across. The sedimentary breccias are relatively massive with little internal structure; thin beds of fine-grained material that show sedimentary layering are rare. However, textural features are generally indistinct because the sedimentary breccias have been metamorphosed to biotite hornfels by the underlying granitic intrusions.

The distribution of sedimentary breccias at Mount Pleasant is shown in Figures 2 and 3. They appear to be conformable layers that separate the three ash flow units of quartz-feldspar porphyry. The uppermost breccia unit is at least 50 m thick along the margin of the caldera and pinches out to the east (Fig. 3). It has been traced for a short distance south of the Fire Tower fault where it either pinches out or is truncated by granitic dykes or croscutting breccias (Fig. 2). The lowermost unit is as much as 25 m thick near the caldera margin and pinches out to the south. It likely pinches out to the east also but its distribution in this direction is not well known.

The sedimentary breccia is lithologically similar to much of the sedimentary breccia or "sharpstone conglomerate" in McCutcheon's (1983) Scoullar Mountain Formation, which occurs at various localities around the margin of the Mount Pleasant caldera. The sharpstone conglomerate consists

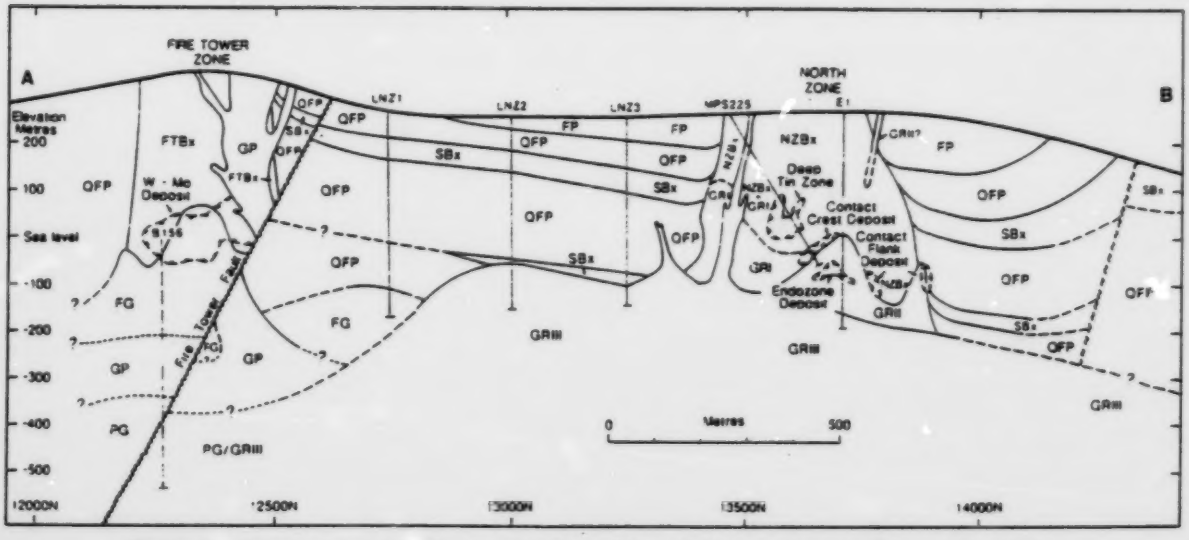


Figure 2. Cross-section A-B (Fig. 1) through the Mount Pleasant area (see Figure 1 for legend).

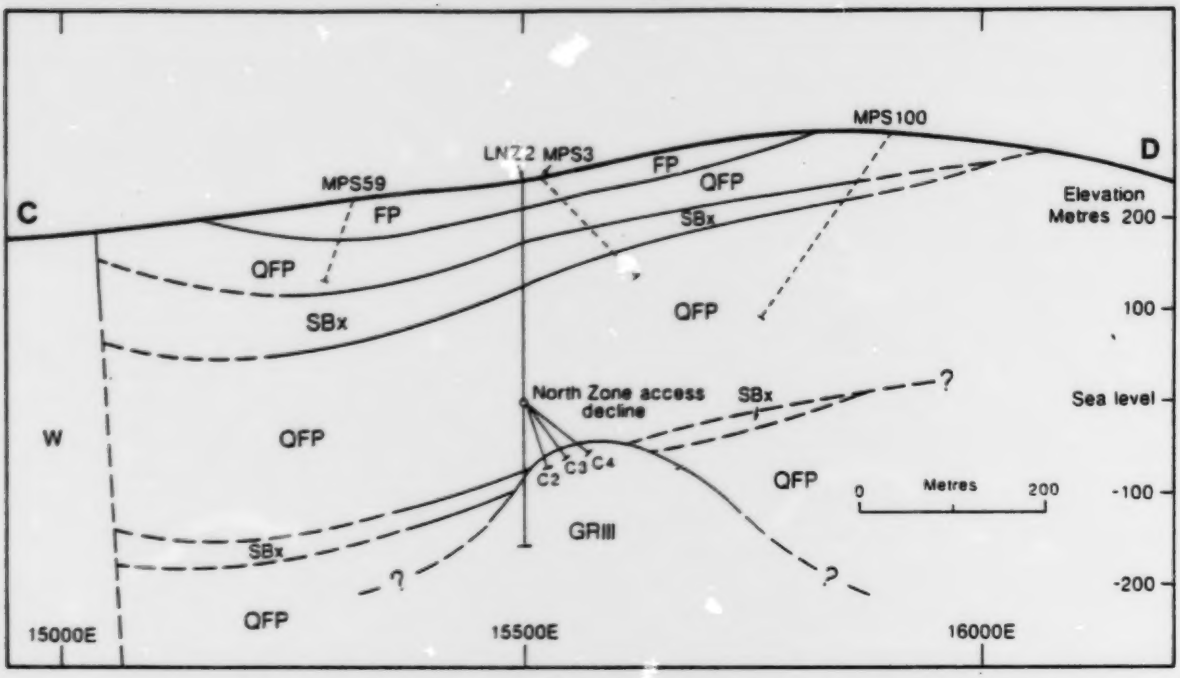


Figure 3. Cross-section C-D (Fig. 1) through the Mount Pleasant area (see Figure 1 for legend).

predominantly of angular, unsorted, clast-supported fragments of metasedimentary rock in a comminuted matrix of the same material. Fragments of felsic crystal tuff and, in places, granite are lss abundant. Internal layering with a water-worked matrix is rare. The conglomerate is interbedded with mafic to intermediate lavas and pyroclastic rocks, and felsic tuffs. Which of the Scoullar Mountain sedimentary breccia units correlate with those at Mount Pleasant is uncertain. However, all the sedimentary beccia units represent talus and/or other types of colluvial deposits derived mainly from nearby metasedimentary and granitic rocks that formed the caldera walls during the initial infilling of the caldera. The volcanic fragments probably were contributed by a precaldera eruptive unit which has been eroded (McCutcheon, 1985).

North Zone breccia

The ash-flow tuffs and interbedded sedimentary breccias have been highly brecciated and intruded by granitic rocks in two areas designated the Fire Tower Zone and the North Zone (Fig. 1). In both these areas, crosscutting magmatic-hydrothermal breccias and intrusive rocks form irregular, pipelike complexes that were centres of subvolcanic intrusive and hydrothermal activity. Similar to the Fire Tower breccia as described by Kooiman et al. (1986), the North Zone breccia is composed of multiple phases which range from matrix-supported breccias with rounded fragments to clast-supported crackle breccias with predominantly angular fragments. Both fragments and matrix material in the breccias have been altered extensively. Siliceous alteration consisting of quartz and topaz is most prevalent; however chlorite and/or biotite alteration is also present. Because of the alteration, textures and lithologies of the fragments are difficult to recognize. Relationships between the breccia and associated granitic rocks have also been obscured by alteration in many places.

The North Zone breccia probably was formed by repeated episodes of hydraulic fracturing related to the release of volatiles during crystallization of Granite I. Forceful emplacement of the breccia is indicated by the deformation of older sedimentary breccia units which have steep to vertical dips adjacent to their contacts with North Zone breccia.

GRANITIC INTRUSIONS

Based on field observations, granitic rocks in the North Zone appear to have formed three distinct intrusions which, from oldest to youngest, are designated Granite I, Granite II and Granite III. The three granites, where relatively unaltered, are similar mineralogically and consist of quartz, K-feldspar, plagioclase and biotite (typically chloritized). Texturally, they range from aplitic to porphyritic and, in Granite III, to medium-grained equigranular. As they can all appear similar in hand specimen, distinction between the different granites is based to a large extent on mutual contact relationships. However, Granite I and Granite II are commonly fractured and highly altered and in many places contact relationships between these two intrusions are not obvious.

Granite I

Granit I occurs as irregular bodies closely associated with the North Zone breccias. Its contacts with the breccias are commonly gradational and fragments of Granite I are abundant locally within the breccias. In this regard it is analogous to fine-grained granite of the Fire Tower Zone. Granite I is typically fine grained and equigranular in relatively unaltered specimens. However, in most areas textural features of Granite I have been obscured by pervasive chloritic and/or silicic alteration. Porphyry tungsten-molybdenum deopsits in the North Zone appear to be related to Granite I.

Granite II

The main body of Granite II occurs at the base of the North Zone complex (Fig. 2). Dyke-like extensions of Granite II have intruded the overlying breccias and associated host rocks in places. Porphyry dykes that outcrop at surface may be related to Granite II.

Granite II varies from aplitic to porphyritic in texture. Parts of Granite II also contain features that reflect fluid saturation and/or undercooling of the parent magma, including miarolitic cavities and comb quartz layers. The combquartz layers consist of parallel to subparallel layers in which quartz crystals are oriented approximately perpendicular to the planes of layering (Fig. 4,5) (cf. Kirkham and Sinclair, in press). They are one of a family of unidirectional solidification textures (USTs) that are associated with fluid-saturated and/or undercooled magmas (cf. Shannon et al., 1982). Granite associated with the comb quartz layers commonly contains micrographic intergrowths of quartz and K-feldspar (Fig. 6), a feature that is also characteristic of undercooled granitic melts (Walker, 1976; Fenn, 1979).

Granite II consists of multiple phases which have internal contacts marked by chilled zones and USTs such as comb quartz layers. The distribution of USTs shown in Figure 7 appears to outline a small intrusive phase within Granite II. Figure 7 also shows an internal contact in diamond-drill hole C83 that is marked by aplitic layering. In general, these internal phases are either local or obscured by alteration and cannot be traced from one drillhole to another.

Tin deposits in the North Zone are associated mainly with Granite II. The Endozone, Contact Crest and Contact Flank deposits, for example, occur either within or at the contact of Granite II (Fig. 2). The Deep Tin Zone is also likely related to Granite II although not as closely associated spatially. Tin zones near surface in the North Zone (not shown in Fig. 2) are associated with porphyry dykes that may be offshoots of Granite II. Because of its relationship to tin deposits, Granite II is comparable to granite porphyry of the Fire Tower Zone, which is also associated with tin zones (Kooiman et al., 1986).

Granite III

Granite III forms a large body that underlies both the North and Fire Tower zones. In the North Zone, contact relationships show clearly that Granite III has intruded granites I and II. The contacts between Granite III and the other granites are commonly sharp and in many places are marked by thin (0.5 to 2 cm wide) layers of USTs, mainly K-feldspar, in Granite III. The upper contact of Granite III appears to have its apex west of the North Zone. Dykes of Granite III extend upward from the main body. Preliminary chemical data indicate that Granite III is identical to porphyritic granite of the Fire Tower Zone.

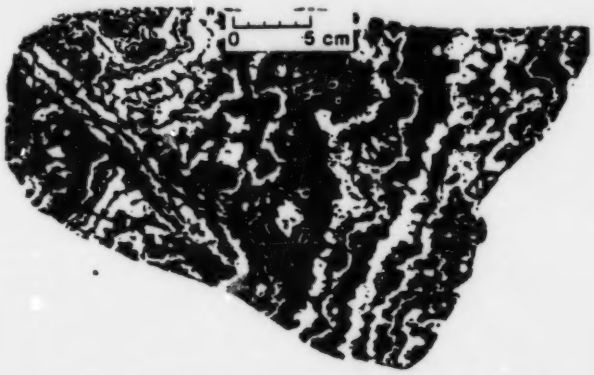


Figure 4. Comb quartz layers in granite porphyry from the Fire Tower Zone; quartz crystals in the layers terminate towards the right. GSC 204152-H

Figure 5. Photomicrograph (uncrossed nicols) of comb quartz layer in Granite II showing euhedral termination of quartz crystals approximately perpendicular to the layers; the very fine grained texture of the granite adjacent to the crystal faces probably resulted from pressure quenching related to the sudden release of the fluid phase in which the quartz crystals were growing. GSC 204152-T

Granite III is typically fine- to medium-grained equigranular although porphyritic and pegmatitic varieties are also present. Miarolitic cavities ranging from 1mm to 2 cm in size are locally abundant; in places they form 1 to 5 % by volume of the granite over several metres of drill core. The cavities are typically lined by quartz and feldspar crystals and filled by light green, very fine grained sericite (Fig. 8). Muscovite, chlorite, fluorite and carbonate are present in many cavities; arsenopyrite, molybdenite and other metallic minerals (unidentified) are rare.

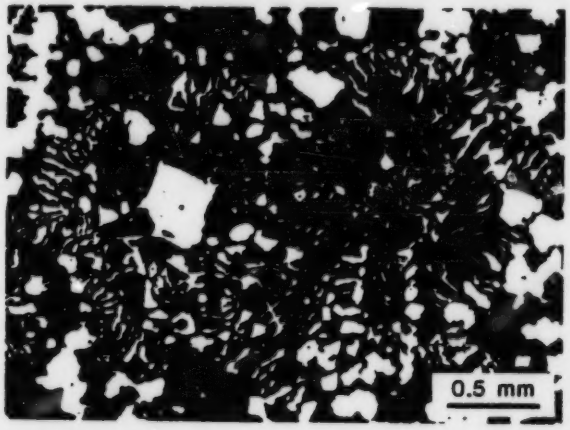


Figure 6. Photomicrograph (uncrossed nicols) of well-developed micrographic intergrowth of quartz (light) and K-feldspar (dark) in Granite II. GSC 204152-U

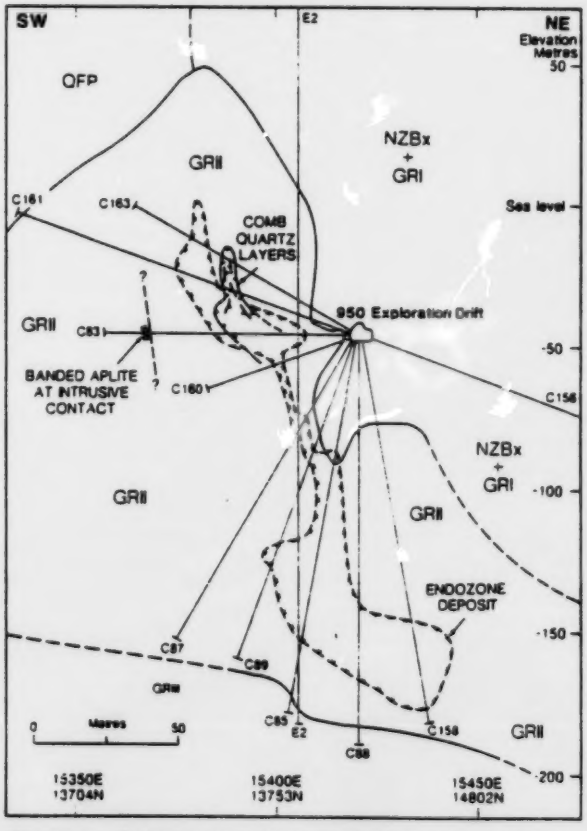


Figure 7. Cross-section (3A) through the Endozone deposit, North Zone (see Figure 1 for legend).

Granite III is generally less fractured and altered than Granite I and Granite II although some areas have been pervasively sericitized. Despite this sericitic alteration and fluid saturation textures such as the miarolitic cavities described above which are evidence of hydrothermal activity related to Granite III, only a few isolated tin zones have been found associated with it. However, exploration of Granite III to date has been too limited to assess fully its potential for associated deposits.

TIN DEPOSITS

Tin deposits and porphyry tungsten-molybdenum deposits in the North Zone represent two separate episodes of mineralization even though the deposits overlap spatially. Porphyry tungsten-molybdenum deposits resemble in many respects those in the Fire Tower Zone described by Kooiman et al. (1986). They consist of large zones of mineralized factures, quartz veinlets and disseminations in North Zone breccia and, to a lesser extent, Granite I. The host rocks have been altered to a very fine grained assemblage of quartz, topaz, fluorite and sericite. Wolframite, molybdenite, bismuth and bismuthinite are the principal ore minerals; abundant arsenopyrite and loellingite are also present. Total reserves in the porphyry tungsten-molybdenum deposits of the North Zone are approximately 11.5 million tonnes grading 0.20 % W, 0.06 % Mo and 0.09 % Bi.

Tin is distributed in the North Zone in a variety of deposits which span a wide vertical range. Near surface, numerous small, poorly-defined sulphide-rich replacement deposits occur in altered feldspar porphyry associated with aphanitic dykes referred to as "banded quartz-feldspar porphyry" by Ruitenberg (1967). These deposits have been

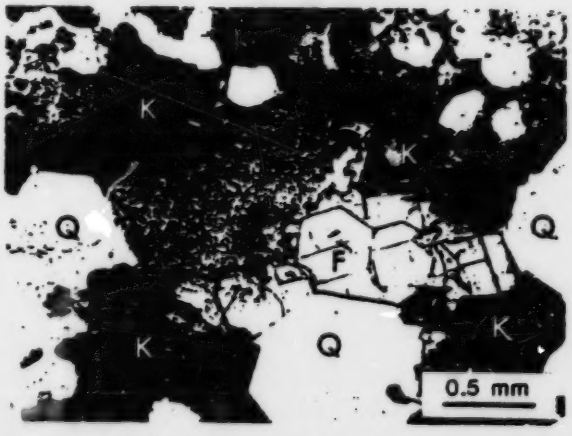


Figure 8. Photomicrograph (uncrossed nicols) of miarolitic cavity in Granite III lined with crystals of quartz (Q), K-feldspar (K), fluorite (F) and molybdenite (M) and filled with sericite (S). GSC 204152-V.

described by Ruitenberg (1963, 1967) and others (e.g. Hosking, 1963; Petruk, 1964). In these deposits, very fine grained cassiterite and lesser amounts of stannite are associated with arsenopyrite, loellingite, sphalerite and chalcopyrite. Other less abundants sulphides and sulpharsenides include pyrite, marcasite, galena, molybdenite, tennantite, bornite, bismuthinite, wittichenite and roquesite. Quartz, fluorite, topaz and chlorite are the principal alteration minerals. Proven reserves in these deposits are approximately 250,000 tonnes with an average grade of 0.6 % Sn, 2.3 % Zn, 0.30 % Cu and 0.36 % Pb (Mulligan, 1975).

Most of the potentially economic tin deposits in the North Zone occur at depths of 200 to 400 m below surfac. They include the Deep Tin Zone, Contact Crest, Contact Flank and Endozone deposits (Fig. 2). The Deep Tin Zone is a relatively large, irregular deposit that consists of fracture-controlled and disseminated cassiterite in silicified and chloritized North Zone breccia and Granite I. The cassiterite is fine grained but visible in hand specimens. Other associated minerals include arsenopyrite, sphalerite, chalcopyrite and galena. Some wolframite and molybdenite are also present, which may be due to the superposition of the Deep Tin Zone on one of the porphyry tungsten-molybdenum zones (not shown on Fig. 2). Reserves in the Deep Tin Zone are approximately 2.14 million tonnes grading 0.45 % Sn, 0.06 % W, 0.03 % ;Mo and 0.80 % Zn (0.45 % Sn represents a "cut" grade; intervals grading more than 2 % Sn have been cut to 2 %).

The Contact Crest and Contact Flank deposits occur mainly in North Zone breccia or other associated host rocks at the upper contact or along the sides of Granite II, respectively. The Endozone deposit, on the other hand, occurs mainly within Granite II. In many other respects, these deposits are similar. Cassiterite is the principal tin mineral and occurs as finely disseminated grains and as fine to medium-sized grains in veins or veinlets and along fractures. Minerals associated with the cassiterite include arsenopyrite, sphalerite, chalcopyrite, pyrite and pyrrhotite. Chlorite, fluorite, quartz and topaz are the main alteration minerals. Crosscutting relationships indicate as many as 6 stages of alteration and mineralization; details of the paragenesis of the Endozone, the largest of these deposits, is curently the subject of a Master's thesis study by C. Inverno (Colorado School of Mines). Total reserves in the Deep Tin Zone, Contact Crest, Contact Flank and Endozone deposits have been estimated at 5.9 million tonnes averaging ;0.79 % Sn (The Northern Miner, 14 October 1985, p. 11).

DISCUSSION

The Mount Pleasant intrusions were emplaced at the margin of the Mount Pleasant caldera in a subvolcanic environment. The present depth of the intrusions from surface (300 m or less) and the likelihood that no more than 600 to 700 m of overlying volcanic and sedimentary rocks have been removed by erosion suggest that the intrusions were emplaced at a depth of about 1 km or less.

The subvolcanic ;emplacement of the granitic intrusions has implications for the generation of the hydrothermal fluids that formed the ore deposits. In such a shallow environment of intrusion, involvements of both meteoric and magmatic fluids in the formation of the tin deposits might be expected. Preliminary data from a study of fluid inclusions (Samson, 1987) indicate that meteoric water may have been involved in at least one stage of tin mineralization. On the other hand, Granite II, which is most closely associated with the tin deposits, contains a number of features that suggest a significant portion of the ore-forming fluids were magmatic. The presence of miarolitic cavities and comb quartz layers in some phases of Granite II indicate that they were fluid-saturated. The same phases commonly contain micrographic intergrowths of quartz and K-fldspar. These textures reflect undercooled conditions in the magma which could have been due to pressure quenching caused by rapid separation of ore-bearing fluids. A genetic relationship between tin deposits and associated phases containing these features, such as the one outlined by the comb quartz layers on Figure 7, thus seems likely, Research currently in progress with B.E. ;Taylor (Geological Survey of Canada) to examine stable isotopes (O,H,C,S) of the granitic rocks and associated mineralized zones will provide insights to the nature of the ore-forming processes, including the relative importance of magmatic versus meteoric fluids.

Whether or not the Mount Pleasant intrusions are closely related to volcanic rocks within the Mount Pleasant caldera is uncertain as the age of the intrusions has not been completely resolved. K-Ar and Rb-Sr isotopic studies (Kooiman et al., 1986) indicated a Late Mississippian age of 340 to 330 Ma. On the other hand, $^{40}Ar/^{39}Ar$ data suggested a Late Devonian-Early Mississippian age of about 360 Ma (D.A. Archibald, pers. comm., 1985), essentially the same age as the Piskahegan Group rocks which the granites have intruded. More accurate and precise dating of the granitic rocks by U-Pb isotopic analysis of manozite is being considered to resolve this discrepancy. Rb-Sr isotopic studies of fluorite associated with the various granitic intrusions and associated deposits, currently underway with R.P. Taylor (Carleton University), may also contribute to a resolution of the age of the Mount Pleasant intrusions.

The Mount Pleasant intrusions have been classified as A-type granite (Taylor et al., 1985; Kooiman et al., 1986). Geochemical and petrographic work currently underway will help to characterize the intrusions at Mount Pleasant within a broader context of other granites in New Brunswick (e.g. Fyffe, et al., 1981; Ruitenberg and Fyffe, 1982; McLeod, 1986; Whalen, 1986).

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